

DOCUMENT RESUME

ED 218 869

EC 143 134

AUTHOR Whyte, Lillian A.
TITLE A Study of the Effectiveness of Prescriptive Teaching for Exceptional Children.
INSTITUTION Alberta Univ., Edmonton. Faculty of Education.
SPONS AGENCY Canada Council, Ottawa (Ontario).
REPORT NO ISBN-0-88864-985-1
PUB DATE 80
GRANT S71-0791
NOTE 219p.
AVAILABLE FROM University of Alberta, Faculty of Education, 4-116 Ed. N., Edmonton, Alberta T6G 2G5 Canada (\$8.00 each).

EDRS PRICE MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS Academic Achievement; Check Lists; Cognitive Development; Delivery Systems; *Diagnostic Teaching; *Disabilities; Elementary Education; Language Acquisition; *Program Effectiveness; Psychomotor Skills; Resource Teachers; Social Development; Teacher Aides; *Teacher Effectiveness

ABSTRACT

The study was designed to demonstrate the effectiveness of diagnostic teaching with 70 children (6 to 14 years old) with learning and behavioral disorders and to investigate the administrative plan which is most efficient and effective for implementing diagnostic teaching. Ss were divided into three experimental groups--Experimental Group I with teachers assisted by a resource teacher responsible for clinical remediation and by a teacher aide, Experimental Group II with teachers assisted by a resource teacher only, and Experimental Group III with teachers assisted by teacher aides. Teachers were graded in the areas of lesson preparation, teaching skills, communication skills, relationship with pupils, classroom management, and professional and personal qualities; and students were given a test battery of descriptive and diagnostic tests. The psychoeducational diagnosis process was considered in terms of test information collection, guidelines for analyzing test results, and interpretation of psychoeducational data. Several case studies demonstrated how the prescriptive teaching programs were designed and implemented. Pre- and posttest analyses focused on students' intellectual, perceptual-motor, language, social, and academic development. Among findings were that prescriptive teaching was successful in improving functioning in language, perceptual-motor, social, and academic development; although test scores did not increase in a simple one to one ratio of remedial exercise to area of deficit; and the administrative plan most efficient and effective in implementing the prescriptive teaching program was the teacher aide and resource teacher combined, with the resource teacher alone almost as effective. A checklist to assist teachers in structuring observation of the child is included. (SB)

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A STUDY OF THE EFFECTIVENESS OF PRESCRIPTIVE TEACHING FOR EXCEPTIONAL CHILDREN

Lillian A. Whyte, Ph.D.

Sponsored by:
Canada Council
Project S71-0791

1980

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First published by
Faculty of Education
University of Alberta
Edmonton, Alberta, Canada
1980

ISBN 0-88864-985-1
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Canadian Cataloguing in Publication Data

Whyte, Lillian A.

A study of the effectiveness of prescriptive
teaching for exceptional children

Bibliography: p.

ISBN 0-88864-985-1

I. Exceptional children - Education

1. University of Alberta. Faculty of Education.

II. Title.

LC3965 W499

371.9

C80-091039-7

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Printed by
University of Alberta Printing Services
Edmonton, Alberta

ACKNOWLEDGEMENTS

The present study was made possible through a grant provided by Canada Council (Project #S71-0791). To the Council we extend our sincerest gratitude.

To the University of Alberta, and particularly Dr. T. Maguire and Mr. Ray Barie of the Computer Centre, Mrs. Pat Uhlich and to the secretaries of the Educational Psychology Department, and Mr. Larry Leclair of the Audio-Visual we also extend our gratitude.

Other persons whose contributions must be acknowledged are the Research Assistants. Special thanks are extended to Mrs. Isabel Evans, Senior Research Assistant. To the secretaries who prepared this report, our sincere thanks.

Last but not least to the Administrators of Strathcona County, including the Directors of Special Education and the Principals and Vice-Principals, to the teachers who allowed us to use their classrooms for experimental teaching and to the three teachers in the County of Leduc who permitted us to use their classrooms for contrast classrooms, a thank you can only be an understatement of our gratitude. Finally, to the parents and children who so patiently bore with us and from whom we learned so much, we hope you have profited as much from this project as have the project directors.

Lillian Whyte, Ph.D.
Project Director and Author of Report

Mrs. Elizabeth Blowers, Ph.D.
Associate Project Director

PREFACE

This book has been published with the help of a grant from the Social Sciences Federation of Canada, using funds provided by the Social Sciences and Humanities Research Council of Canada.

The purpose of the study was to attempt to find better ways to teach exceptional children. Volumes have been written already on the topic, nevertheless, many exceptional children continue to be underdeveloped, undereducated and underchallenged.

It is the firm belief of the directors of the study that as educators and psychologists we owe much more to the exceptional child and his parents. The effort to achieve better methods of education, diagnosis and counselling of exceptional children ultimately will produce additional benefits. As exceptional children grow through our efforts, psychologists and educators grow through their understanding of the exceptional child and ultimately of all children.

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PART 1: THE STUDY

CHAPTER I INTRODUCTION

Traditionally, children with learning and emotional disorders have been grouped in special classes by disability label and administered a modified traditional education program. In the 1960's many studies were conducted to measure the efficacy of such programs for exceptional children (Coleman, 1966; Dunn, 1969; Goldstein, Moss and Jordan, 1965; Hoelke, 1966; Johnson, 1962; Kirk, 1964; Passow, 1957; Rubin, et al., 1966; Smith and Kennedy, 1967; Wright, 1967).

The weight of the research evidence showed consistently that either there were no differences in academic and social achievement between exceptional children in segregated and integrated classes, or those in integrated settings were achieving at a higher level than those in segregated settings despite the fact that special education in segregated classes costs significantly more and personnel are generally better trained. Exceptional children in both settings, however, do not appear to be receiving an adequate education.

Various proposals have been made to improve the education of exceptional children. Dunn (1969) proposed a diagnostic teaching program administered to the child in the regular classroom and using resource personnel whenever necessary. Bateman (1967) also suggested a learning disability approach (that is, diagnostic teaching) for the education of exceptional children. Blackman (1967) went one step further and proposed taxonomic teaching. In taxonomic teaching there is analysis of the curriculum as well as diagnosis of the child, training in the child's deficient areas and resultant matching of the child's strengths and deficits with relevant curriculum.

The arguments for and against prescriptive teaching have been discussed by Mann (1972a and b), Sabatino (1972), Bortner (1972), Bardon (1972), Hagin and Silver (1972), Scagliotta (1972), Barsch (1972), Moss (1972), Cogen and Ohrthman (1972) and Ysseldyke (1973). Koppitz's five year follow-up study (1971) of of learning disabled children can also be considered an evaluation of diagnostic teaching.

Mann (1972a) says:

What distinguished all the new approaches, which (can be jointly termed) differential psychoeducational, ...is that, explicitly or implicitly, they are directed toward the differential analysis and assessment of specific "learning abilities" and "disabilities". Such "learning abilities" and "disabilities" are hypothesized to be basic to academic and other types of achievement or malachievement and are presumed to be finitely separable, diagnosable, and (by many) trainable (p. 5).

Mann criticizes "differential psychoeducational" methods on a number of points.

1. The concepts have been borrowed from medicine and psychology and have been of little value in programming for handicapped children.
2. Supposedly this group of educators have stated they ignored etiology (disability labels) and denied its relevance to educational problems. In fact the movement is etiological. It has simply substituted "psychoeducational reifications" for medical ones.

3. Any attempt to conceptualize "educational skills" and any attempt to make a differential assessment of "abilities" and "skills" is simply to "flesh out" and "reify" abstractions in psychometric garb.
4. To speak of training perceptual, language and cognitive abilities is to speak of metaphors; the peril is that "people may be used by metaphors".
5. The psychoeducational diagnostician proclaims he can precisely delineate abilities for the purposes of educational training. The tests used by psychoeducational diagnosticians lack the validity to perform this task. Psychoeducational tests cannot a) appropriately distinguish one group of handicapped individuals from another, and the handicapped from the non-handicapped; b) effectively differentiate specific areas and sub-areas of functioning; c) measure underlying or basic abilities or functions of the tests; d) appropriately assess strengths and weaknesses in the underlying abilities they are assessing; e) assess processes and abilities identified by the tests and subtests that presumably measure them; f) identify the major or most important ability parameters in the domain being assessed.
6. It is questionable whether a) the processes or functions identified by the differential psychoeducational tests are ones toward which specific training can and should be directed; b) the tests can be used to program for children more effectively than traditional approaches to evaluation; c) programs of differential ability training are more effective than global programs directed in traditional forms toward curricular accomplishments.

Mann concluded his critique by stating that it is time to settle down

...to systematic, long term efforts to improve the education of the handicapped and learning-disabled child on the basis of appropriately determined goals. We will do this most effectively if we concern ourselves with products (achievements), rather than processes (abilities) (p. 13).

Many of Mann's comments are valid but he overstates the case. Special educators do not accept without question the statements he makes so categorically. The whole point of research in prescriptive teaching is to determine the truth or falseness of the statements Mann apparently assumes have been accepted as fact. Indeed, the article has value in indicating the areas of research which should be investigated.

In a later article (1972b) Mann again states his concerns with regard to prescriptive teaching. They are:

1. I believe that ability constructs are potentially useful; they have been overused and abused these past years; they really have not proven their validity as presently employed.
2. I am in favor of differential assessment and precision in measurement. I do not believe, however, that the instruments we have at present (certainly not the standardized tests) permit the "pinpointing"...of ability and disability areas in children. (That's where we are at.)...
3. I am concerned with special education's strained attempts to become scientific by using tools in areas where more modest technological efforts would be more

legitimate. I think we are more appropriately at a stage where careful description and ordered data accumulation are in order (pp. 53-54).

These three concerns sum up the attitudes of most special educators who are attempting to determine the value of prescriptive teaching. It is these concerns which force us to focus our research on the questions raised by Mann. Special educators cannot afford to wait twenty years for comparison studies to prove again that we have been wrong, as we did with traditional programs.

Scagliotta (1972) also attacks prescriptive teaching, but mainly because of the tests as they are used and abused. The tests are developed in isolation in a clinic which does not really reflect a realistic learning situation. They pay attention to deficits while ignoring strengths.

Two researchers, Sabatino (1972) and Bortner (1972), argue the advantages of prescriptive teaching. Sabatino argues that such programs "are feasible with the right combination of paraprofessionals and professionals". Bortner maintains that prescriptive teaching offers us at least three alternatives which traditional programs do not: (1) instruction can be restructured in such a way as to draw upon cognitive strengths rather than weaknesses for the achievement of given goals; (2) instructional sequences can be changed so demands are in accordance with the emergence of competencies; (3) we can make use of prosthetic devices.

Bardon (1972), Hagin and Silver (1972), Barsch (1972), Moss (1972), and Cogen and Ohrthman (1972) see prescriptive teaching as a useful possibility which may produce beneficial rewards. Bardon summarizes their view of prescriptive teaching:

"(it is) an approach to educational improvement which deserves a chance to be tried, not only in the behavioral laboratory and the clinician's office, but in the classrooms where it must ultimately prove itself" (p. 34).

Up to this point in time, there is little empirical support for prescriptive teaching. While the proposals appear to be sound, very little research has been done to demonstrate the value of prescriptive teaching, particularly over the long term. There have been methodological problems in the research which has been carried out. For example, gain-score research has been criticized on several points: the Hawthorne effect has been ignored; there have been inadequate controls, regression effects, and lack of reliability among diagnostic devices.

The present study was an attempt to overcome some of these problems. There was an attempt to tie together the problems of assessment and treatment and their implementation. While not a long-term study it did continue for a school year, thus circumventing some of the limitations of studies which last for short periods each day for six to eight weeks. Mainly the study was an attempt to determine whether prescriptive teaching would produce positive results over a relatively long period and whether it would point out the value of various assessment tools, and determine which tests would produce patterns of strengths and weaknesses. One test used alone may be an inefficient instrument but several tests indicating the same pattern of strengths and weaknesses should increase our confidence in what must be (given the present status of diagnostic tests) an educated guess. Until better diagnostic tests are available, we can but make our decisions based on patterns of functioning which are verified from several sources.

Finally, by looking at multiple aspects of functioning, it was hoped that at least tentative evidence would be forthcoming to determine:

1. Areas in which the child's functioning could be improved.
2. Areas which showed little or no change.
3. Categories of exceptional children who might benefit most from this method.
4. The circumstances under which change (if any) would occur, that is, what additional help does a teacher require to produce maximum increase in the child's functioning.
5. Specific tests in which scores improved as a result of teaching with programs designed to improve specific deficit areas.
6. Tests where scores improved even though direct teaching had not been employed to increase these scores. Stated another way, would skills learned in clinical teaching situations transfer so that scores on tests such as the Stanford-Binet, WISC, Piagetian tests, and California Test of Personality would increase.
7. Whether academic achievement improves, indicating exceptional children can benefit from academic programs.
8. If a child is completely lacking in one area (e.g., ability to use phonetic skills), is it possible to teach an academic skill through an area of strength (e.g., teach reading using a visual approach) while remediating the deficit, and then transfer him to a program which requires him to use both the deficit which has been ameliorated and the strength, thus enlarging his problem solving skills?
9. Is it possible to combine developmental information and learning theory, e.g., if we assess where a child is in the developmental hierarchy, is it possible to use a particular learning theory such as operant conditioning to move him to the higher stages in the developmental hierarchy?
10. What is the part to be played by prescriptive teaching in a total school program?
11. What additional questions need to be asked and answered before we can reap the greatest benefits from prescriptive teaching?

In summary, the present study was designed to establish more valid and efficient ways of developing exceptional children. The magnitude of the problem has been demonstrated by the CELDIC Report (1970), a three-year study on emotional and learning disorders in children, which estimated there are one million such children in Canada. Better educational programs would result in better social, academic, and by implication, vocational adjustment. Thus, the present study has economic implications as well as implications for improved mental health for the country as a whole. Specifically the study was designed:

1. To demonstrate the effectiveness of diagnostic teaching with six groups of children with learning and emotional disorders.
2. To investigate the administrative plan which is most efficient and effective for implementing diagnostic teaching.

Definitions

For the purposes of the present study, the following operational definitions were used:

1. *Psychoeducational Diagnosis*: An assessment process by which an educator attempts to determine "what" a child does and does not know, as well as "how" and under what conditions he best learns. It is *operationally* defined as an assessment process which diagnoses a child's present status of intellectual, language, spatial, social and academic functioning by administering a combination of standardized tests, rating scales, informal check lists, and questioning methods and materials designed by Jean Piaget and other researchers in the field of developmental psychology.
2. *Prescriptive Teaching*: From the data obtained from the psychoeducational diagnosis, a prescriptive teaching program was designed and administered. The terms "programming" and "diagnostic teaching" are used interchangeably for prescriptive teaching. Prescriptive teaching is *operationally* defined as a teaching method in which programs are planned for:
 - a. remediation of deficits in language and spatial functioning, based upon information obtained from the psychoeducational assessment;
 - b. development of academic skills by selection of teaching programs in reading and arithmetic and spelling based upon the child's areas of strengths as determined from information obtained from the psychoeducational assessment;
 - c. amelioration of behavior problems and development of social skills by applying strategies for behavior management and physically structuring the teaching environment when information from the psychoeducational assessment indicated structuring or management strategies were necessary.
3. *Traditional Teaching*: A method of teaching by a combination of many methods with no emphasis being placed on any one method in particular. It is *operationally* defined as a teaching program which:
 - a. utilized curriculum content generally taught to children in regular classes but appropriate for younger children;
 - b. combined phonic, language experience, and other methodological approaches without any specific rationale for selection of the methodology.
 - c. employed management strategies but without a specific rationale for selection of the strategy.

CHAPTER II BACKGROUND AND OUTLINE OF THE STUDY

Preliminary Investigation

Over a period of two years, three pilot projects were carried out. Two were continued for four month periods and one for an entire school year. The subjects in these projects were children in "opportunity" classrooms, that is, children who were diagnosed as mentally retarded on the basis of I.Q. scores or failure to function in regular classrooms and placed in a "special" class. Two of the pilot studies were carried out with subjects in the twelve- to fourteen-year range and in one pilot study the subjects were in the six- to nine-year range. Extensive diagnosis indicated that children in "opportunity" classes included every category of exceptional children: hard-of-hearing children, behavior problems, children with learning disabilities, emotionally disturbed children, culturally deprived children, as well as mentally retarded children. Whatever the label, however, the children did not and could not function in a regular academic classroom as they are presently constituted.

The pilot studies served the purpose of indicating the areas in which the children could not function, thus indicating the course assessment should take. They also indicated the types of programs and teaching methods which might prove valuable. Finally, the results indicated a number of problems which required investigation.

Subjects

The present study included nine groups of "opportunity" class children. The classes were selected from two neighboring counties in Alberta. The six experimental classes constituted almost the entire segregated special class population of one county. These classes were chosen because it was possible to have some control over the "teacher" variable. The six teachers of these classes were graduates of a B.Ed. program with a special education major at the University of Alberta. They had taken courses, including practicum courses, from the senior researcher in the study and on evaluative criteria used for grading were comparable in teaching ability. Furthermore, they expressed a willingness to participate in the study.

The children in the Contrast Group were in three "opportunity" classrooms in a neighboring county and comprised their entire segregated special class population. The two counties were comparable: both served mainly rural populations and the children represented the same SES levels.

A total of seventy children were included in the study. Children who left the section during the study and transferred to another school were not included in the analysis of data, although they followed the same program as the other children while they were in that classroom. Seven of the children in the contrast groups and four in the experimental groups were lost for this reason. A description of both the experimental and contrast subjects is presented in Tables I and II. Table I provides a description of chronological age for both the pretest and posttest periods. The mean C.A. for both the contrast and total experimental groups is very similar (107.94 and 110.90 months, respectively) but the range is somewhat wider for the

experimental subjects. The C.A. range for both contrast and experimental subjects was comparable at the beginning of the study but three of the older children in the contrast group either dropped out of school or left the section.

TABLE I
CHRONOLOGICAL AGE DESCRIPTION OF EXPERIMENTAL
AND CONTRAST SUBJECTS

Group	Chronological Age							
	Pretest				Post Test			
	N	$\bar{X}$	S.D.	Range	N	$\bar{X}$	S.D.	Range
Contrast	17	107.74	24.66	69-143	17	112.94	24.66	76-150
Total Experimental	53	110.50	25.50	74-171	53	117.90	25.50	81-178
Experimental Group I	18	114.72	24.80	78-161	18	121.72	24.80	85-168
Experimental Group II	17	95.47	9.82	81-112	17	102.47	9.82	88-119
Experimental Group III	18	121.67	29.2	74-171	18	128.67	19.2	81-178

TABLE II
I.Q. DESCRIPTION OF EXPERIMENTAL
AND CONTRAST SUBJECTS

Group	N	$\bar{X}$	S.D.	Range
Contrast	17	71.7	10.1	50-93
Total Experimental	53	74.5	13.6	46-107
Experimental Group I	18	69.6	8.1	51-82
Experimental Group II	17	76.5	13.9	48-96
Experimental Group III	18	77.6	15.8	46-107

The subjects in the experimental group were divided into three subgroups. Experimental Group II children were considerably younger than the children in Experimental Groups I and III. The experimental subjects in the six classes were housed in three different schools. This decision was made by the county school administrators and was not a factor which could be controlled. Each of the three schools housed two opportunity classes and the administrative plan in the research program was the same for the two classes in each school. Since Group II was housed in one school and included only younger children, there could be no selection of older children. The method of administering the program for each group was selected randomly.

The I.Q. distribution for the various groups is described in Table II. The mean WISC (Wechsler, 1949) Full Scale I.Q. at the time of pretesting was 71.7 for the Contrast Group and 74.5 for the the Total Experimental Group. Experimental Group III had the highest mean I.Q. (77.6) and Experimental Group I the lowest

(69.6). Experimental Group I was also the most homogeneous on I.Q. scores (range 51-82). Experimental Groups II and III were very similar in mean I.Q. The means were 76.5 and 77.6, respectively.

The groups were fairly comparable in terms of I.Q. and both the contrast and experimental classes included subjects with a wide variety of disabilities. In the interests of "a tighter research design" it is true that more variables should have been controlled, however, teachers in special classes are not given the luxury of selecting homogenous groups of children. The groups selected are typical of what one finds in special classes, at least in the province in which the study was carried out. This is a fact we must live with at least for the present. If prescriptive teaching is to prove valuable, it must be in the classroom. The subjects selected and treated in this study were selected, therefore, from typical "opportunity" classrooms and treated under the conditions which are usual in "opportunity" classrooms. It was assumed that advantages would outweigh disadvantages by conducting the research in a realistic situation, that is, under the conditions in which special class teachers normally must teach.

Scope of Investigation

Both the contrast and experimental groups were pretested and posttested. The Contrast Group received a battery of tests which are usually considered descriptive rather than diagnostic. The experimental groups were administered the same battery of descriptive tests and also a rather extensive series of diagnostic tests. Both groups were pretested in the first month of the school year and posttested in May of the following year. The experimental groups were taught using a prescriptive teaching approach in the intervening seven months, while the contrast group received the traditional curriculum normally followed in opportunity classrooms.

The experimental subjects included the children in six "opportunity" classrooms. The experimental subjects were further divided into three groups of two classes each, as prescriptive teaching was to be carried out in different administrative settings. In the six classrooms the special class teacher was responsible for the supervision, management and organization of his/her classroom. In Experimental Group I the teachers were assisted by a resource teacher who was responsible for any clinical remediation prescribed for the child, in either one-to-one or small group situations, and by a teacher aide who assisted the teacher by supervising the children, answering questions, etc., while the teacher carried out the regular classroom routines of teaching academic subjects to small groups or gave group instruction to the whole class. Each child was seen in clinical situations one and one-half hours per week. The teacher was also assisted by a teacher aide during one-half of each teaching day in the week. Both the resource teacher function and teacher aide function were carried out by the same group, a third-year practicum group taking a major in special education at the University of Alberta. The course was given by the senior researcher in the study.

The teachers of the second group, Experimental Group II, were given the assistance of a resource teacher only. Each child was remediated in areas of deficit in a one-to-one situation or in small groups. The special classroom teacher was given a prescription which described the child's strengths and weaknesses and

advised concerning the academic programs which would develop these skills by teaching through areas of strength. For this group, as well as the other two groups, as soon as a deficit was ameliorated it was considered a strength and became part of the child's academic program. For example, when a child mastered the ability to discriminate beginning sounds, that skill was incorporated into his word attack skills in reading. The children in Experimental Group II were taught most of their academic program (reading and arithmetic) by their classroom teacher, while remediation of deficit areas was carried out by a research assistant who functioned in the role of a resource teacher. The teacher was also assisted in teaching the number program, by a resource teacher. The resource teachers for Group II were fourth-year students in special education at the University of Alberta. Each child was seen approximately one and one-half hours per week in a one-to-one or small group situation.

The teachers of the third experimental group, Experimental Group III, were assisted by teacher aides who worked under the direct supervision of the teacher. The teacher aides were responsible for helping the children while the teacher carried out the instruction for both the remediation and academic programs in one-to-one or small group situations. These teachers were assisted by the teacher aide four days each week.

The contrast subjects were taught their usual program by their teacher who received no assistance whatever. The teachers of the Contrast Group had B.Ed. degrees and several years experience in teaching "opportunity" classes but they did not have a special education teaching major. Their approach can be described as eclectic: behavior modification was used with some children, traditional didactic teaching materials were used, and they followed a traditional academic program as closely as was possible with these children.

Teachers

The six teachers of the experimental subjects were graduates of the B.Ed. teacher training program at the University of Alberta. The six teachers had majored in Special Education and were taught the practicum component of the special education program by the senior researcher and author. The practicum component of the program consisted of the courses where the students are given experience in teaching exceptional children.

There were nine "opportunity" special classes in the county from which the experimental subjects were selected. The teachers in three of the classes had not taken a special education major. For this reason only the six classes taught by teachers who had majored in special education were included in the study.

Teachers were graded on their ability in the following areas:

1. *Lesson preparation:* The criteria used for judging competence in this area included ability to define objectives, plan procedures, select aides, prepare materials, adapt to situations. They were also judged on the appropriateness of objectives, ability to divide the lesson into appropriate divisions and methods used to evaluate pupil progress.
2. *Teaching skills:* The criteria used for judging teaching skills were:
 - a. Motivation

- b. Illustration/explaining
 - clarity
 - appropriateness of examples
 - checking for understanding
 - c. Questioning skills
 - amount
 - suitability
 - distribution throughout class
 - development
 - distribution of question types—questions requiring recognition and recall, convergent-one answer responses, divergent-multi-answer responses, interpretation and evaluation responses.
 - d. Instructional aides
 - sufficient use
 - suitability
 - neatness
 - organization
 - e. Discussion
 - f. Pace, division of time
3. Communication skills
- command of English
 - quality of voice
 - enunciation and pronunciation
 - printing/handwriting/use of blackboard
 - non-verbal
4. Relationship with pupils
- empathy and awareness of child's needs
 - ability to individualize instruction within a group situation
 - ability to secure and hold class attention
5. Classroom management
- a. handling routines
 - grouping for instruction
 - scheduling to meet the child's needs
 - organization of class to meet grouping needs
 - b. Behavior management
6. Professional and personal qualities
- attitude
 - initiative
 - vitality
 - sense of humor
 - accepts and acts on supervisory suggestions
 - relationships with colleagues

Students were graded on a nine-point grading system. Grades of 8 and 9 are used to denote excellent teaching ability. The six classroom teachers of the experimental subjects received grades of 8 or 9 for their practicum courses in special education. The resource teachers were judged comparable in teaching ability.

The teachers of the contrast subjects had not received a special education major at the University of Alberta, however, they had taken one or more courses in special education at universities outside Alberta. The Project Directors were in the school in which the contrast subjects were housed during the time required for testing and on several occasions prior to the testing and therefore had opportunity to observe the teachers while they were teaching. The teachers of the contrast subjects were considered by the Project Directors to be above average in teaching ability.

Tests Administered

Two types of tests were administered. Descriptive type tests were administered to both the experimental and contrast groups. Diagnostic tests were administered to the experimental groups only. It was assumed that any change which would occur as a result of teaching should be manifested by changes in scores on the descriptive tests. Without this gain we must assume that changes are superficial and skills are not transferring. Unless the child can apply the skills acquired in different contexts it seems reasonable to assume the skills have not been acquired at the level of understanding and application. The value of remediating deficits identified by diagnostic tests would, therefore, be questionable.

1. The Descriptive Tests

A. Intellectual Ability:

1. *The Stanford-Binet Test of Intelligence, Mental Age and IQ (Terman and Merrill, 1960)*: If the number of months of intellectual growth gained was sufficient to cause gains in the I.Q. score, we can tentatively conclude that we have increased the child's rate of intellectual growth, at least during the period under study.

2. *WISC Verbal, Performance and Full Scale I.Q., (Wechsler, 1949)*: These tests were administered to determine whether verbal and/or performance scores will increase as a result of remediating perceptual-motor and language deficits. The WISC scores were determined on the basis of six verbal tests prorated for five, and five performance tests; the Maze subtest was not administered.

3. The scaled scores of the WISC were considered in clusters suggested by Bannatyne (1968). They are the *spatial pattern* determined by adding the scaled scores on the Picture Completion, Block Design and Objective Assembly subtests; the *conceptualization pattern* determined by adding the scaled scores on the Comprehension, Similarities and Vocabulary subtests; the *sequencing pattern*

determined by adding the scaled scores on the Digit Span, Coding, and Picture Arrangement subtests.

4. *Six tests of Logical Thinking Ability* designed from descriptions of tasks by Piaget and his co-workers:

- a. two tests of *classification ability* (Whyte, 1969):
 - 1) inclusion of classes
 - 2) multiplication of classes
- b. two tests of *basic number concepts* (Almy, 1970):
 - 1) conservation of number
 - 2) seriation
- c. two *infralogical* tests (Lovell, 1979):
 - 1) conservation of length
 - 2) measurement of length

The tests of logical thinking ability were designed to determine whether a child had reached the stage of concrete operational thinking. They were used to determine where the child was in the developmental hierarchy of stages.

B. *Perceptual-Motor Ability:*

1. The *Goodenough-Harris Draw-a-Man Test* (Harris, 1963) was administered to determine whether knowledge gained in teaching body image transferred to drawings of the human figure.

2. The *Bender-Gestalt Test* (Bender, 1938) was administered to determine whether training in perceptual-motor skills such as form perception and eye-motor coordination would transfer by improving the child's ability to reproduce and organize the figures in the Bender-Gestalt test.

C. *Social Ability:*

A rather naive approach was taken in assessing social ability. School personnel and parents usually make the following complaints about special class children: they are hyperactive, unable to play with other children, aggressive, unaware of what is socially appropriate, and unable to perform social skills expected of children at their age level. The tests administered were an attempt to determine: (1) how the child views his own personal and social adjustment; (2) how others see him and (3) his level of social skills.

1. The *California Test of Personality* (Thorpe, Tiegs and Clark, 1953) was an attempt to assess how the child views himself. There are scores expressed as percentiles for personal adjustment, social adjustment, and total adjustment as well as for specific abilities within these broader categories.

2. *Activity Level* was determined by modifying a scale constructed by Ayres (1969) for this purpose. The scale ranged from 1 to 5, 3 was considered normal. The child was observed on a number of occasions by one of the supervisors of the project. Skeletal movement, talking, interference with others, and display of emotions were observed and a scale score value assigned to each variable. The average activity level of the various aspects of behavior was then determined. The teacher was also asked to complete a similar checklist from her experience with the

child. The two lists were compared and percent of agreement determined (over 85% agreement was found). Where there were discrepancies, the scores were averaged. Discrepancies were usually minimal, for example, a scale score between 2 and 3, rather than 2 or 3.

3. *The Vineland Social Maturity Scale* (Doll, 1949) was used to determine the Social Age and Social Quotient of the child's social skills.

D. Achievement:

Achievement was measured in one of two ways: a readiness test for children with no measureable academic skills, and an academic achievement test for children functioning in academic areas.

1. *Metropolitan Readiness Test* (Hildreth, Griffiths and McGauvron, 1964): The Metropolitan test consists of six subtests and is intended to determine readiness for number and reading. The subtests are word meaning, listening, matching, knowledge of the alphabet, pre-number skills, and copying. Since these abilities all require the skills involved in the remedial program, they should increase as a result of remediation.

2. *The Stanford Achievement Test* (Kelley, Madden, Gardner and Rudman, 1964): Four of the subtests were administered: word meaning (word attack skills), paragraph meaning (reading comprehension), spelling and arithmetic. An average grade in reading can also be computed by averaging the word meaning and paragraph meaning scores.

II. The Diagnostic Tests

A. Intellectual Ability:

1. The individual WISC subtests (Wechsler, 1949) were considered separately and in clusters with other data to see whether they indicated possible patterns of dysfunction.

2. The *Piagetian tasks*, while not wholly diagnostic, were used as an indication of where to begin instruction with the child, e.g., if a child was at stage II in the number concepts' tests, he was considered ready for experiences leading to counting; if he was concrete operational, he was considered ready for an intensive arithmetic program.

B. Perceptual-Motor Ability:

1. *The Purdue Perceptual-Motor Survey* (Chaney and Kephart, 1969), was administered to assess motor-related abilities. The tasks in this test supposedly measure (1) Balance and Posture; (2) Body Image and Differentiation; (3) Perceptual-Motor Match; (4) Ocular Control; (5) Form Perception. Performance is rated on a scale of 1 to 4, with 4 as high score.

2. *The Harris Test of Lateral Dominance* (Harris, 1947) is intended to measure which hand, foot and eye are dominant, and whether dominance is established (right or left) or mixed.

3. *The Frostig Developmental Test of Visual Perception* (Frostig, 1966). There are five subtests in this test: (1) Eye-Motor Coordination; (2) Figure-Ground; (3) Form Constancy; (4) Position in Space; (5) Spatial relations.

4. *Localization of Topographical Positions* (Laurendeau and Pinard, 1970) is said by Piaget to measure one aspect of representational space: the ability to copy left and right, and top and bottom movements when the model to be copied is facing the child and when the model has been rotated 180 degrees.

5. *The Concepts of Left and Right Test* (Laurendeau and Pinard, 1970) is also said by Piaget to measure a second aspect of representational space: the concept of *opposition* of left and right on his own body, on the body of a person facing him, and as a relative notion, that is, an object can be both left and right.

C. Language Ability:

1. *The Peabody Picture Vocabulary Test* (Dunn, 1959) was administered as a measure of reception of language; both M.A. and I.Q. scores are obtained from the PPVT.

2. *The Wepman Test of Auditory Discrimination* (Wepman, 1958) was administered to determine the child's ability to discriminate sounds and the pattern of his disabilities, if any.

3. *The Illinois Test of Psycholinguistic Abilities* (Kirk and McCarthy, 1968), usually referred to as ITPA, includes twelve subtests, supposedly measuring two levels of language ability (habit and meaningful levels), two channels of language ability (auditory and visual), and three processes of language (reception, integration and expression). At the automatic-sequential level (habit level) short term rote memory and closure are said to be measured both for the auditory and visual channels.

D. Social Ability:

1. The "*three mountains*" test designed by Piaget and designated "coordination of perspectives" was administered to determine stage of social development. The test has also been used as a representational space test (Laurendeau and Pinard, 1970). The rationale for using the test as a test of social ability is that before a child can understand another person's point of view, he must be able to put himself in another person's place mentally and visualize the scene the other person would see.

2. *The California Test of Personality Subtests* (Thorpe, et al., 1953) were considered separately, to better understand the child's feelings about himself and others.

E. Achievement:

1. The Metropolitan Readiness (Hildreth, et al., 1964) and the Stanford Achievement Tests (Kelley, et al., 1964) were used as a "starting point" in selecting academic material, e.g., if a child scored grade 2.1 on word recognition skills, reading instructional materials designed for children at the grade two level were selected; if a child received a letter grade of "D" on the Metropolitan, a readiness program, rather than a formal reading instructional program was considered appropriate.

2. *Diagnostic Arithmetic*: A diagnostic arithmetic test to assess the child's understanding of the natural number system and designed by the senior researcher for another study on number development was administered (Whyte, 1972). The

subtests included in the arithmetic test were (1) understanding of concepts associated with counting; (2) understanding of place value; (3) properties of the natural number; (4) computational skills. The test was designed for children from grades I through VI. A second form of the test was used for posttesting.

3. *The Doren Diagnostic Reading Test* (Doren, 1956) was administered to children who were reading below the expected level for their mental age.

F. Supplementary Tests:

Each child was administered a telebinocular test (Spache, 1961) and five were referred for visual acuity examinations. Each child was also given an audiology assessment. The first test was administered by a doctoral student in reading and the second test by a graduate student in speech. Eight children were given an assessment for speech problems by graduate students in the Speech Department. One child was given a psychiatric assessment by the personnel in a Government Mental Health Clinic. Several of the children were from broken homes and had been placed in foster homes and, when possible, their social workers were consulted for information relevant to understanding their social and emotional behavior.

Description of Treatment

1. Experimental Groups

The subjects in the experimental groups were pretested in September by the senior researcher, the two persons who helped to supervise the project, and six research assistants. Five of the six research assistants had been trained in courses at the University of Alberta to administer all but four of the tests: the Stanford-Binet, the WISC, the Bender Gestalt, and the ITPA. The sixth research assistant was a Ph.D. candidate in counselling and school psychology. She assisted the senior researcher and the two supervisors of the project in administering the remaining tests. To help eliminate bias, either positive or negative, the testers alternated in the tests they were to administer. Prior to testing, the children were given the time and opportunity to feel at ease with the persons who administered the tests. The children appeared to enjoy the testing sessions probably because of the amount of individual attention they received. The testers worked in groups to administer the group tests (e.g., the Stanford Achievement test), and were assisted by students in Special Education who were enrolled in a course in psychoeducational diagnosis.

When the testing was completed, the directors of the project worked together to prepare the prescriptive teaching programs for each child. They then met the teachers and the research assistants, and the case studies and proposed programs were discussed. When the teachers added information not apparent from tests (e.g., information on motivation or failure avoiding tendencies in a child), the programs were modified to consider these variables.

Organizing the schedules so that small groups manifesting the same deficits or strengths could be taught together constituted the most complex problem. While children received individual instruction when necessary, grouping was employed whenever possible. The reasons for stressing grouping were numerous but the most important were: (1) it is simpler to "organize" a class if you are teaching four groups of three to four children, than if you are providing individual instruction for

each child; (2) social adjustment and behavior problems were exhibited by most of these children and consequently one major task was to teach them to work together; (3) it was assumed by the researchers that social interaction would stimulate the children to learn from each other and was therefore an important objective. The researchers also believed that all children must do their own learning and this is more easily accomplished when he/she is competing with his peers than simply following the directions of an adult.

Student progress was monitored closely by competency tests as each unit of curriculum was completed. The teachers and project directors met regularly to discuss the progress (or lack of progress) for each child. Children making progress were moved forward accordingly. For children who were not progressing, programs were modified and alternative strategies used.

It occurred frequently that one child in a group would quickly "outgrow" the group and if it was to his benefit, the children would be regrouped for more homogeneity. However, if it appeared that being at the top of his group was helping the child to adjust socially and if he was not resented by the other children, a child might stay in the group to help improve his self-concept.

Frequently the older children exhibited interest in the materials being used to teach the younger children. This interest often took the form of helping the younger children by explanation and teaching. This interest was encouraged when the older children had free time because it was assumed that not only would the younger child benefit, but the older child would also benefit by reinforcing his own basic skills and of more importance, by acquiring leadership skills, dependability, and self-reliance.

The prescriptive teaching program lasted for seven months and was administered in the same manner described in a previous section. Two of the special class teachers were assisted by both resource teachers and teacher aides, two by resource teachers only and two by teacher aides only.

The children did not follow the prescriptive teaching program for the entire day. Education consists of more than academic work and remediation programs, consequently time was set aside for such programs as art, music, etc.

It is impossible to include a full description of the teaching program but in the following chapters (chapters III and IV) an attempt will be made to demonstrate the procedures followed, by presenting fairly detailed programs for an individual child and/or small groups of children.

The Experimental Subjects were posttested in May with the descriptive and diagnostic tests. Whenever possible alternate forms of the test were used.

2. The Contrast Group

The Contrast Subjects were pretested and posttested at the same time and under the same conditions as the Experimental Subjects. They were administered only the descriptive tests. The results were given to the teachers to use as they saw fit. The children in each of the three classrooms followed a similar program except that the teacher of the youngest children made more use of didactic teaching materials than the teachers of the other two classes. She also made more use of behavior modification techniques. The chief differences between the two types of

programs were that the teachers of the contrast subjects did not attempt to remediate basic deficits or to match curriculum with the child's strengths on the basis of diagnostic test data. Their efforts were concentrated on teaching academic skills (specifically reading, writing and arithmetic) and to a lesser extent, improving social adjustment. From what the project directors were able to observe, the teachers were very capable and they were interested in increasing the skills of these exceptional children. The children reacted to the testing as the Experimental Subjects had, that is, they seemed to enjoy the individual attention and reacted favorably to the test administrators. The children in the Contrast Group were posttested in May with the descriptive tests.

Analysis of Data

All information was coded on IBM cards. The data were analysed in two steps:

1. The data which dealt with the descriptive tests for the Experimental and Contrast Groups were considered first.
2. The data which involved the diagnostic tests for the Experimental Groups I, II and III were considered separately. These data were considered in two ways:
 - a. by treatment group;
 - b. by chronological age group.

The data for the Contrast and Experimental Groups were analyzed in the following manner:

1. The means and standard deviations were determined for the pretest and posttest scores for the descriptive tests for,
 - a. the Total Experimental Group and the Contrast Group, and
 - b. the three Experimental Groups considered separately.
2. The Gain Scores for each of the variables on the descriptive tests were determined for the two groups, the Experimental and the Contrast Groups.
3. Analysis of covariance was determined between the Contrast Groups and the three Experimental Groups on the diagnostic posttest variables with the pre-measure as covariate, correcting for differences in appropriate pretest scores.

The data on the Experimental Groups were analyzed in the following manner:

1. The data were analyzed by three treatment groups (already described) and by C.A. group; three chronological age groups were selected: less than 8 years, 8 to 11-0 years, and 11-1+ years.
2. The means and standard deviations were determined for the pretest and posttest scores for Experimental Groups I, II, and III, and for the three C.A. groups.
3. The Gain Scores for each of the variables on the diagnostic tests were determined.

4. Analysis of covariance was determined for the three Experimental Groups, both by C.A. and treatment group, on the diagnostic posttest variables with the pre-measure as covariate, correcting for differences in appropriate pretest scores.

CHAPTER III THE PSYCHOEDUCATIONAL DIAGNOSIS

In order to demonstrate how the prescriptive teaching programs were designed and implemented several sample case studies will be discussed in Chapter IV. The discussion will include the entire procedure from diagnosis through prescription through implementation. Before dealing with the individual cases, however, the information which formed the basis for diagnosis will be discussed.

Perhaps the greatest single criticism made against prescriptive teaching is the lack of diagnostic tests which will adequately assess the child. The criticism is justified in part, but diagnostic tests used with caution can serve a worthwhile purpose. If a variety of tests indicate and substantiate a pattern of deficits and strengths, one should be justified in making an educated hypothesis which can be used as a basis for treatment.

The researchers in the present study sought to find patterns of functioning in several ways. A number of tests thought to be assessing functioning in a particular area were used in each of the five areas assessed: intellectual, language, perceptual-motor, social and academic. Patterns of functioning were traced within each area as well as across the areas.

The diagnostic process will be considered under three headings: (1) collecting and organizing test information; (2) guidelines for analyzing test results; (3) interpreting psychoeducational data.

COLLECTING AND ORGANIZING TEST INFORMATION

The tests were administered to the children in the manner described in Chapter II. The test information was organized in case study form. The case study format is described below.

Case Study

A. Summary: Observation of behavior and school performance:

A brief summary of behaviors believed by teachers to be significant formed the basis for a preliminary hypothesis.

B. Test Data:

1. Intellectual Data

(1) WISC:

Verbal IQ	_____
Performance IQ	_____
Full Scale IQ	_____

*Verbal Subtests**Scaled Score*

Information _____
 Comprehension _____
 Arithmetic _____
 Similarities _____
 Vocabulary _____
 Digit Span _____

*Performance Subtests**Scaled Score*

Picture Completion _____
 Picture Arrangement _____
 Block Design _____
 Object Assembly _____
 Coding _____

(The breakdown into patterns suggested by Bannatyne (1968) was also included. The patterns were: 1 - the conceptualization pattern, the sum of the scaled scores of the Comprehension, Similarities and Vocabulary subtests; 2 - the spatial pattern, the sum of the scaled scores of the Block Design, Object Assembly, and Picture Completion subtests; 3 - the sequencing pattern, the sum of the scaled scores of the Digit Span, Coding and Picture Arrangement subtests.)

Conceptualization Pattern:

Comprehension + Similarities + Vocabulary:

_____ + _____ + _____ = _____

Spatial Pattern:

Block Design + Object Assembly + Picture Completion:

_____ + _____ + _____ = _____

Sequencing Pattern:

Digit Span + Coding + Picture Arrangement:

_____ + _____ + _____ = _____

(2) *Stanford Binet Intelligence Test:*

Mental Age _____

IQ _____

(3) *Piagetian Tasks—Logico-Mathematical Concepts Tasks:**Classifications Tasks:*

Inclusion of classes: stage _____

Multiplication of classes: stage _____

Mathematical Concepts:

Conservation of number: stage _____

Conservation of length: stage _____

Measurement of length: stage _____

Seriation: stage _____

Summary and discussion of the data in the intellectual assessment:

(A summary of the pattern of functioning as determined by the intellectual tests was completed at this point.)

II. Language Data

(1) *Illinois Test of Psycholinguistic Abilities (ITPA):*

Because many of the children were in the C.A. range where scaled scores could not be determined, scores were converted to language ages.

(a) *Automatic-Sequential Level Subtests:*

<i>Auditory Channel Subtests</i>		<i>Visual Channel Subtests</i>	
Auditory Memory	_____	Visual Memory	_____
Auditory Closure	_____	Visual Closure	_____
Sound Blending	_____		
Grammatical Closure	_____		

(b) *Representational Level Subtests:*

<i>Auditory Channel Subtests</i>		<i>Visual Channel Subtests</i>	
Auditory Reception	_____	Visual Reception	_____
Auditory-Vocal Association	_____	Visual-Motor Association	_____
Vocal Expression	_____	Motor Expression	_____

(2) *Peabody Picture Vocabulary Test (PPVT):*

Mental Age _____

IQ _____

(3) Wepman Test of Auditory Discrimination:

Number of X errors _____

Number of Y errors _____

Summary and discussion of the data in language assessment:

(A summary of the pattern of functioning as determined by the language tests was completed at this point.)

*III. Perceptual-Motor Data**(1) Frostig Developmental Test of Visual Perception:*

Because many of the children were in the C.A. range where scaled scores could not be determined, scores were converted to perceptual ages.

Eye-Motor Coordination _____

Figure Ground _____

Form Constancy _____

Position in Space _____

Spatial Relations _____

(2) Purdue Perceptual Motor Survey:

Scores are expressed on a scale from 1(low) to 4(high).

Balance and Posture _____

Body Image and Differentiation _____

Perceptual-Motor Match _____

Ocular Control _____

Form Perception _____

(3) Piagetian Tasks—Representational Space:

Concept of opposition left and right: stage _____

Localization of topographical positions: stage _____

Coordination of perspectives: stage _____

(4) *Harris Test of Lateral Dominance:*

Dominance established:	yes _____
	no _____
Eye dominance	_____
Hand dominance	_____
Foot dominance	_____

(5) *Bender Gestalt Test:* _____(6) *Goodenough-Harris Draw-A-Man Test:* _____

(Bender Gestalt and Draw-A-Man test results are presented as standard scores.)

Summary and discussion of the data in perceptual-motor assessment:

(A summary of the pattern of functioning as determined by the spatial tests was completed at this point.)

IV. *Social Development Data*(1) *California Test of Personality:*

(scores are presented as percentiles.)

Personal Adjustment:

Self-reliance	_____
Sense of personal worth	_____
Sense of personal freedom	_____
Feeling of belonging	_____
Withdrawing tendencies	_____
Nervous symptoms	_____
Total personal adjustment	_____

Social Adjustment:

Social standards	_____
Social skills	_____
Anti-social tendencies	_____
Family relations	_____
School relations	_____
Community relations	_____
Total social adjustment	_____
Total adjustment	_____

(2) Activity Level:

(Activity level was scored on a scale of 5 (low or hypoactive) to 1 (high or hyperactive). Activity level was determined in four areas: body movement, speech, display of emotions, interference with others. Overall activity level was designated as the average across the four areas.)

Body movement	_____
Speech	_____
Display of emotions	_____
Interference with others	_____
Overall activity level	_____

(3) Vineland Social Maturity Scale:

Social Age	_____
Social Quotient	_____

(4) Piagetian Task: A Test of Egocentricity:

Coordination of perspectives: stage	_____
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(5) *Other relevant data*

e.g. reports on foster home placement.

Summary and discussion of the data in social assessment:

(A summary of the pattern of functioning as determined by the social tests and rating scales was completed at this point.)

V. Academic Data

Academic tests were of two types—(1) tests of academic achievement - both general and diagnostic - for children able to function in reading and arithmetic, and (2) readiness tests for children who had not yet acquired academic skills.

(1) *Standardized Achievement Tests:**Stanford Achievement Test:*

Reading—	Word attack skills:	_____
	Paragraph meaning:	_____
Arithmetic—	Counting:	_____
	Computational skills:	_____
	Problem solving:	_____

Diagnostic Tests:

(a) Arithmetic: (The arithmetic test was designed by the author for an earlier study and can be obtained by contacting her. Functioning in the arithmetic test is presented in descriptive terms. Performance in four areas of the natural number system was assessed - counting, place value, laws of the system, and computation skills.)

*Counting Errors:**Place value errors:**Properties of the natural number system:*

Properties understood: _____

Properties not understood: _____

Computation skills (describe nature of errors):

Basic Facts _____

Addition process _____

Subtraction process _____

Multiplication process _____

Division process _____

- (b) *Reading (Doren Diagnostic Test)* - description of errors:
- (c) *Spelling* - description of errors:
- (d) *Handwriting characteristics described:*

(2) *Readiness Tests:*

For children where there were no measureable academic skills the *Metropolitan Readiness Test* was administered. There are scores for six subtests, and a total score (an average). Scores are presented as letters: A indicates excellent prognosis for performance in an area; B very good prognosis; C average prognosis; D and E indicate poor and very poor prognosis respectively.

Word meaning	_____
Listening	_____
Matching	_____
Alphabet	_____
Number	_____
Copying	_____
Total readiness	_____

Summary and discussion of the data in academic assessment:

(A summary of the pattern of functioning as determined by the academic tests was completed at this point.)

Overall Analysis of Findings

Once patterns of functioning were determined within areas of assessment, the total picture was analyzed to determine how specific deficits and strengths manifested themselves across the various areas. The treatment programs were then designed with focus on three areas: remedial or clinical programs, academic programs, and the procedure for dealing with the child's functioning in affective areas.

GUIDELINES FOR ANALYZING TEST RESULTS

Whenever possible research findings published in the literature were used to interpret the test data. The clinical experience of the project directors was also employed extensively.

I. Analysis of Intellectual Test Data

A. Standardized Intelligence Tests:

WISC: To analyze WISC test results a great deal of reliance was placed on the Glasser and Zimmerman (1967) text, *Clinical Interpretation of the Wechsler Intelligence Scale for Children*. Glasser and Zimmerman in turn have employed

primarily the Cohen (1959) factorial analysis of the WISC. Because Glasser and Zimmerman's interpretation of the WISC is used extensively in the present study, the information on factor structure for each of the WISC subtests will be summarized.

(a) Verbal Subtests:

The Information subtest is thought to be an important component of the WISC, second only to Vocabulary in measuring general intelligence or "g" as "g" is represented by the WISC Full Scale IQ. This is particularly true from age 10½. A very low score on the Information subtest may suggest a child with intellectual limitations, or possibly mental retardation. Low scores may also reflect an orientation toward non-achievement such as is frequently found in disadvantaged environments.

The Comprehension subtest is a moderately good measure of "g" but is the least reliable of the subtests. At the earlier ages this subtest loads on a factor hypothesized as reflecting "application of judgment to situations following some implicit verbal manipulation" (Glasser and Zimmerman, 1967, p.51). Low scores can suggest that the child's ability to cope with his everyday environment may have been limited due to psychological or physical restrictions.

Cohen's analysis of the Arithmetic subtest revealed that Arithmetic is similar to Comprehension as a measure of "g" but also contributes to "verbally retained knowledge impressed by formal education" at ages 7½ and 10½. By age 13½, Arithmetic measures specifically "freedom from distractibility" particularly when combined with Digit Span. At 10½ and 13½ large differences would allow one to draw inferences of specific arithmetic ability or disability. Glasser and Zimmerman concluded the Arithmetic subtest may serve as a measure of a kind of verbal intelligence for the younger child but for the teen-aged child it appears to be more related to attention based on manipulation of numerical operations.

The Similarities Subtest is a moderately good measure of general intelligence. High or low scores on this subtest have several implications as does the method of response. Children may respond to items on the Similarities subtest in three ways: responses are concrete (plum and peach are alike because they have skins) or functional (they can be eaten), or abstract and conceptual (they are both fruit). The level of concept formation used by the child is important since the more abstract the response, the more intelligent the child. Used in this way, the Similarities subtest becomes an important diagnostic tool.

Vocabulary ranks as the single best indicator of intelligence ("g"). High scores indicate good familial-cultural background and good schooling as well as information on the child's range and richness of ideas and level of abstract thinking in analyzing and synthesizing. Low scores may reflect limited educational or familial background. In a minority group child lack of encouragement for verbal expression may result in a low Vocabulary score. If the latter is suspected, a picture vocabulary test may present a more accurate indication of vocabulary level. The Peabody Picture Vocabulary Test was administered for this purpose.

Applying the preceding information, the project directors utilized information from the WISC verbal subtests in the following manner. If the Vocabulary and/or Similarities subtests were markedly higher (one or more standard deviations—a S.D. is 3 scaled score points) than the other verbal subtests, it was assumed tentatively that the child's total Verbal IQ score was being suppressed for some reason other than intelligence, for example, a learning disability. While the Information and Comprehension subtests may be "good" measures of general intelligence in "average" children, in the author's clinical experience low scores on these subtests by exceptional children are generally associated with the failure the children meet, particularly in the educational system. This is particularly true for the Information subtest.

If Arithmetic was the one low score in the verbal subtests, a deficit in quantitative reasoning was the tentative hypothesis, particularly if accompanied by low scores on Block Design, Object Assembly and/or Picture Completion. The rationale for this conclusion will be discussed in the section dealing with the performance subtests.

A low, homogeneous range of scores in the verbal subtests was thought to have several possible implications. If accompanied by a similar (or slightly higher) range of scores in the performance subtests and in the Stanford Binet IQ, retardation of a cultural-familial type was considered to be a possibility. If the performance subtests, with the exception of the Picture Arrangement test were consistently higher than the verbal subtests a language deficit was hypothesized. A language deficit as manifested by low verbal scores may be the result of some type of deprivation or possibly some type of pathology. In any case, low verbal scores were assumed to be suggestive of a language deficit and particular notice was paid to language functioning. Low verbal scores also tended to be associated with preoperational level thinking on the Piagetian logico-mathematical concepts tasks.

(b) Performance Subtests:

According to the Cohen (1959) analysis the Picture Completion subtest is one of the poorer measures of general intelligence. For children above age 10 it measures "Perceptual Organization", defined as ability to interpret and organize visually perceived materials against a time limit. In the author's experience a low score on this test is frequently accompanied by low scores on some or all of the Frostig subtests (tests of visual perception). High scores may reflect the ability to establish a learning set or uncommonly good perception and concentration.

The Picture Arrangement subtest measures such factors as perception, visual comprehension, planning involving sequential and causal events, and synthesis into intelligible wholes. High scores may also indicate "social alertness and common sense." In the author's clinical experience, lower verbal than performance IQ is accompanied frequently by a low score on the Picture Arrangement subtest. Both the Picture Arrangement and Picture Completion subtests stress perception of details but the former also provides a measure of the ability to manipulate these details logically. Results of the Picture Completion and Block Design differentiate purely perceptual defects from difficulties with organizing stimuli in sequential progression.

Perception, analysis, synthesis and reproduction of abstract designs are among the factors measured by the Block Design subtest. To perform on the subtest the

child must apply logic and reasoning to space relationships as well as non-verbal concept formation involving an implicit verbal manipulation. Visual-motor coordination is also measured. Block Design is an excellent measure of general intelligence but is also thought to measure a factor known as perceptual organization, that is, "the organization of visually perceived materials in the context of time limitations." Block Design is one subtest which can be interpreted separately as a specific measure of perceptual organization and spatial visualization ability and shares this quality with Object Assembly. Block Design is also an excellent measure of non-verbal intelligence.

The Block Design subtest presents a number of screening implications. When children are unable to express themselves adequately in verbal terms, the Block Design subtest can provide a good non-verbal measure of reasoning. Detection of perceptual distortions suggest further examination for "organic" problems is necessary. Limitations in finger dexterity may indicate specific motor difficulties. In summary, high scores suggest good conceptualizing ability, analytic and synthesizing talents, flexibility in problem solving and excellent finger-eye coordination. Low scores can indicate perceptual problems and poor spatial conceptualization.

Object Assembly is a consistently poor measure of general intelligence but does appear to measure perceptual organization ability especially when paired with Block Design. High scores may indicate good motor skills while very low scores may suggest perceptual and/or visual-motor deficiencies.

The Coding subtest appears to be measuring visual-motor dexterity, particularly pencil manipulation. Coding is a very poor measure of general intelligence. The bulk of the variance of this subtest is accounted for by a specific factor of unknown significance (Cohen, 1959).

Cohen (1959) found that Digit Span by itself does not measure either general intelligence, memory or freedom from distractibility. By age 13½ a factor hypothesized as reflecting "freedom from distractibility" appears and contributes substantially but both Arithmetic and Digit Span are required for this interpretation. Low scores can indicate such problems as possible hearing loss.

Very often psychologists do not administer the Digit Span test, yet in the author's clinical experience exceptional children tend to perform poorly on the subtest. Using the Bannatyne (1968) grouping, Digit Span becomes one of the components of the sequencing pattern. In this study the program directors assumed tentatively the test was measuring nonmeaningful auditory memory. It was hypothesized that comparisons with the auditory sequential memory test on the ITPA would provide additional information as to the function of the Digit Span subtest.

Applying the information on the WISC performance subtests, the project directors concluded that the intratest scatter on the performance tests provided useful information for the psychoeducational diagnosis. A score within the average range on the Block Design test was interpreted tentatively as an indication the child had potential for normal intellectual development. Similarly a low score on the Block Design test which was at variance with average scores on the Similarities and/or Vocabulary tests was interpreted tentatively as an indication of a spatial organization deficit, particularly when the Object Assembly test score was also low.

The Picture Completion test, also part of the spatial pattern, may be interpreted with the Block Design and Object Assembly tests, or separately as an indication of poor or good visual perception.

To summarize the use made of WISC information:

1 - The Verbal and Performance IQ's were compared. A difference bordering on one standard deviation (15 IQ points) was considered significant.

2 - The intratest scatter was considered. First, scores were grouped according to the Bannatyne (1968) patterns. The scaled scores for Comprehension, Similarities and Vocabulary were added as a measure of "conceptualization" ability. The scaled scores for Picture Completion, Block Design and Object Assembly were added as a measure of "spatial" ability. Then the scaled scores for Digit Span, Coding and Picture Arrangement were added as a measure of "sequencing" ability. The average score for a subtest on the WISC is 10 and the standard deviation is 3, therefore, the range of scaled scores from 8 to 12 is considered to indicate average functioning. Since each pattern consists of three tests, the average score is 30 and the average range is 24 to 36.

3 - Within each of the patterns, the intratest scatter was considered. In the conceptualization pattern, if the only low score was for the Comprehension subtest, functioning in this area was considered normal. If the pattern as a whole indicated an area of deficit, a tentative diagnosis of retardation was considered. Supporting evidence for a diagnosis of retardation would be low scores on the Stanford Binet and Block Design tests, low scores on the other two patterns, and overall low functioning in general. If low scores on the conceptualization pattern were discrepant with other information, particularly in the non-verbal area, some form of deprivation or a language disability were considered. It should be stressed the program directors were not interested in labelling the children but simply to "pin down" the nature of the deficit in order to plan the treatment. For example, the program for a child whose scores were generally low and relatively homogeneous would consist of developmental, well-sequenced material with fairly equal emphasis in all areas.

In the spatial pattern, Block Design and Object Assembly were considered as a measure of spatial organizing ability. Low scores in all three of the tests in the pattern, if discrepant with scores for the two other patterns, were interpreted tentatively as indicating an overall deficit in the perceptual-motor area with resultant poor functioning in both motor and visual perception. A low score on Picture Completion alone was generally associated with visual perception deficits of the type described by Frostig.

In the sequencing pattern the scores were interpreted in a number of ways. Overall low scores were interpreted tentatively as a memory and/or sequencing disability. The Digit Span and Coding scores were compared to the Picture Arrangement score as measures of non-meaningful (Digit Span and Coding) and meaningful (Picture Arrangement) memory and sequencing. A low Digit Span score was interpreted as indicating possible memory or sequencing problems in the auditory channel while Coding might indicate possible problems in the visual channel. If Coding was the only low sequencing score and the Picture Completion score was also low, visual perception for detail was seen as a possible area of deficit.

4 – Finally, the WISC intratest scatter in the overall test was considered. Scores on Vocabulary, Similarities and/or Block Design were considered as indicators of intellectual potential. Where discrepancy was found several patterns emerged, e.g., low verbal scores tended to be accompanied by a low score on Picture Arrangement; a low score in Arithmetic tended to be accompanied by low scores in the spatial pattern, particularly Block Design and Object Assembly or to be part of generally low functioning in the verbal area, better functioning in the performance area and preoperational level thought in the Piagetian tasks of logico-mathematical concepts. The majority of children in the study had low scores in Information, Comprehension, Digit Span and less often in Coding.

B. Logico-Mathematical Concepts Tasks:

The Piagetian tasks of logico-mathematical concepts were included as part of the intellectual assessment. These types of tests tend to load both on a general intelligence factor and a "conservation" factor. At the beginning of the study the directors were not too clear as to the relationship of these types of tasks with the standardized intelligence tests. The pilot study data indicated a number of possibilities. Low verbal functioning was accompanied frequently by preoperational level thought. It was found that irregular horizontal development across tasks, particularly among the learning disabled, was a common pattern. Using mental age ranges as a guide, exceptional children tended to be more seriously "retarded" in terms of stage of development than one would expect from the mental age. In the present study the tasks were included for two main purposes, to learn more about their relevance for academic learning and to indicate the types of treatment program preoperational and operational children required.

II. Analysis of Language Test Data

The language tests included the Illinois Test of Psycholinguistic Abilities or ITPA (Kirk and McCarthy, 1968), the Wepman Test of Auditory Discrimination (Wepman, 1958), and the Peabody Picture Vocabulary Test or PPVT (Dunn, 1959). The ITPA supposedly measures two levels of language, representational or meaningful and automatic-sequential or non-meaningful language; two channels in which language develops primarily, auditory and visual; a number of processes at the representational level (reception, association and expression) as well as short term memory and closure at the automatic-sequential levels. There are also two supplementary tests: Sound Blending and Auditory Closure. While scores can be converted to scaled scores language ages were used in the present study, since several children were in the C.A. range where scaled scores could not be derived.

A. Illinois Test of Psycholinguistic Abilities (ITPA):

To facilitate identification of patterns of functioning the ITPA data were diagrammed as follows:

*Representational Level**Auditory Channel*

1. Auditory Reception
2. Audio-Vocal Association
3. Vocal Expression

Visual Channel

- Visual Reception
- Visual-Motor Association
- Motor Expression

*Automatic-Sequential Level**Auditory Channel*

1. Auditory Sequential Memory
2. Grammatic Closure

Visual Channel

- Visual Sequential Memory
- Visual Closure

Supplementary Tests

- Sound Blending
- Auditory Closure

Several types of information can be obtained from the ITPA. In the present study the language ages were used primarily to determine profiles of deficits and strengths. Some of the more common patterns found were:

1 - A channel deficit at both levels in which all (or the majority) of the subtest scores in one channel were lower than all (or the majority) of the subtest scores in the other channel.

2 - A channel deficit but at only one level, the representational or automatic-sequential level.

3 - Level deficits in which all (or the majority) of scores at one level were lower than the subtest scores in the other level.

4 - Process deficits where the scores on the subtests in one process in both channels were below the scores for the subtests in another process. A child might have a process deficit in reception, association or expression at the representational level or a deficit in memory or closure at the automatic-sequential level.

5 - The pattern of deficits formed "no pattern", that is, deficits were isolated and seemingly unrelated.

There are two supplementary subtests on the ITPA: Auditory Closure and Sound Blending. Both subtests attempt to measure the phenomenon of closure. In the Auditory Closure subtest the child is required to grasp a word when only part of the word is presented. Both Auditory Closure and Sound Blending, the ability to synthesize and integrate isolated sounds into a whole word, are thought to be prerequisites in learning a phonic approach to reading. The ability to discriminate sounds is probably basic to both Auditory Closure and Sound Blending. In the present study the Wepman Test of Auditory Discrimination was administered to assess the ability to discriminate sounds.

The deficit found most often in the study was an auditory-vocal channel disability. Such a deficit may be found at both the representational and automatic-sequential levels or at the representational or automatic-sequential level

only. When the deficit was an auditory channel deficit at the automatic-sequential level, the deficit was frequently accompanied by a deficit in auditory discrimination.

Visual-motor channel disabilities in language were also identified but less frequently than auditory-vocal channel language disabilities. When visual-motor channel disabilities were found, they were frequently accompanied by low scores on the Frostig Developmental Test of Visual Perception as well as visual-motor deficits in general, although the latter were less frequent.

A second language deficit found frequently was a level deficit, particularly at the automatic-sequential level. At the automatic-sequential level the lowest score was generally Auditory Sequential Memory followed closely by Visual Sequential Memory. Grammatic Closure was also found to be a low score for many children, although given the grammatic model in many of the homes it is difficult to assess the significance of a low score in the subtest. Nevertheless two points can be made: first, several children from homes where the parents were upper middle class did in fact demonstrate severe deficits in Grammatic Closure; secondly, children not only used incorrect grammar and syntax but used rules which did not even approximate correct forms. Still other children refused to attempt the correct form by "avoidance" tactics, e.g. here is a child, here are two *girls*. The avoidance tactic was followed consistently by several children even after coaching.

Sound Blending was seldom found to be an area of deficit, however, functioning in Auditory Closure was low for many children. Process deficits were found frequently, the most common being an expression deficit. Vocal Expression was generally lower than Motor Expression.

In summary, the ITPA has been criticized severely as an inadequate test of language functioning. The criticism may be justified but the patterns of deficit described by the authors of the test were common among the exceptional children in the present study.

B. The Wepman Test of Auditory Discrimination:

The Wepman was often found to be an invalid test for the children in the present study. The most common reason was the inability of the youngest and dullest children to comprehend the distinction between the concepts "same" and "different". Towards the end of the study when these concepts had been learned, the children were generally able to function within the normal range in auditory discrimination as measured by the Wepman.

C. The Peabody Picture Vocabulary Test (PPVT):

The Peabody Picture Vocabulary Test (PPVT) was administered as a test of receptive vocabulary. The PPVT was a useful estimate of the child's listening vocabulary while the WISC Vocabulary test served as a measure of ability to define words as well as the level of defining ability.

III. Analysis of Perceptual-Motor Data

Several tests purported to assess perceptual-motor abilities were administered. These tests included the Purdue Perceptual Motor Survey (Chaney and Kephart, 1969), Harris Test of Lateral Dominance (Harris, 1947), Frostig Developmental

Test of Visual Perception (Frostig, 1966), Goodenough-Harris Draw-A-Man Test (Harris, 1963), Bender Visual Motor Gestalt Test (Bender, 1938), and two Piagetian tasks of representational space: Localization of Topographical Positions, and Concept of Left and Right (Laurendeau and Pinard, 1970). There were also several indirect measures of perceptual motor ability: the spatial pattern on the WISC and the child's functioning in the visual channel tests on the ITPA, particularly at the automatic-sequential level.

A. The Purdue Perceptual-Motor Survey:

Kephart's (1964, 1970) perceptual-motor theory stresses the importance of movement and perceptual motor skill as the foundation upon which all other learning is based, including the symbolic and conceptual activities of the classroom. Evidence to substantiate Kephart's hypothesis is sparse and controversial but there is some evidence that perceptual-motor dysfunction is at least related to academic disability possibly because the two share a common etiology. Ayres (1965), for example, found that specific perceptual-motor syndromes believed to be neurologically based appear to be etiological factors in arithmetic disability. In the dysfunction group of children definite ties were shown between number concepts and Spatial Relations, Form Constancy and Eye-Motor Coordination subtests on the Frostig test, as well as with body visualization and finger localization. In the dysfunction group, number concepts showed a close affiliation with specific perceptual-motor symptom constellations particularly with perceptual deficit of form and space and with deficit of integration of the two sides of the body (Ayres, 1965). Koppitz (1974) in an eight-year follow-up study of children with learning disabilities concluded that visual-motor integration as such is not specifically related to reading but it is related to achievement in arithmetic and to overall school functioning.

Perceptual-motor functioning was assessed in the present study because: 1 - The literature abounds with data confirming the presence of perceptual-motor disability in many exceptional children. 2 - Such information might give an additional dimension concerning the nature of an academic disability. 3 - While remediation of perceptual-motor disabilities may or may not facilitate academic remediation, perceptual-motor ability is an area of development worthy of consideration in its own right.

Kephart, author of the Purdue Perceptual Motor Survey, is concerned mainly with the perceptual-motor match as the sensorimotor basis of all learning and divides perceptual-motor functioning into five areas: Balance and Posture, Body Image and Differentiation, Perceptual-Motor Match, Ocular Control and Form Perception. The Harris Test of Lateral Dominance is an attempt to assess whether dominance has emerged and the degree to which eye, hand and foot dominance are in agreement. The Goodenough Draw-A-Man test was administered to assess the child's knowledge of and ability to draw the human body and is probably another assessment of body image, and of visual-motor integration.

B. Tests of Visual-Motor Integration and Visual Perception:

The Bender Visual Motor Gestalt Test purports to measure the visual-motor development of the child, a development thought to be parallel to mental

development and associated with language ability. The Frostig DTVP consists of a battery of five subtests of visual perception: Eye-Hand Coordination, Figure Ground, Form Constancy, Position in Space and Spatial Relations.

C. Tests of Representational Space:

Three representational space tests designed by Laurendeau and Pinard (1970) and based on Piagetian theory were administered. As far as the author has been able to determine these tests have not been used previously as part of a perceptual-motor battery. The test, Concept of Opposition of Left and Right, provides information of the child's knowledge of left and right on his own body, the body of a person opposite him and the understanding that an object can be both left and right if compared to more than one other object. The test, Localization of Topographical Positions, is a test of the child's ability to copy left-right and top-bottom positions on the same plane and when the positions must be reversed. The third representational space test, Coordination of Perspectives, was used as an index of social development.

D. The WISC Spatial Pattern:

Working from the hypothesis that there was a deficit in spatial development when the WISC spatial pattern was discrepantly lower than the remaining scores on the WISC, a number of questions were asked to determine the nature of the deficit. If the Block Design, Object Assembly and Picture Completion scores were all low, it was hypothesized tentatively that the deficit was pervasive. If so, the majority of scores on the spatial measures were likely to be low also. If only the Block Design and Object Assembly scores were low, the tentative hypothesis was that the spatial deficit probably involved a visual-motor integration deficit and a deficit in the ability to manipulate three-dimensional space. A low score on Picture Completion usually meant low scores on the Frostig subtests as well.

E. Integrating Spatial Test Data:

Perceptual-motor disabilities were considered from the assumption that a number of disabilities either singly or in combination were possible in three general areas: 1—motor deficit(s), per se; 2—visual-motor integration deficit; 3—visual perception deficits. Poor functioning on the Purdue subtests, walking board and jumping (included in the Balance and Posture subsection of the test), and identification of body parts, imitation of movements, obstacle course and angels-in-the-snow (included in the Body Image and Differentiation subsection) were considered indicative of a motor deficit per se.

Poor performance on the Bender Gestalt, the Eye-Motor Coordination subtest of the Frostig, the Draw-A-Man test, the Form Perception subtest of the Purdue, and the Coding subtest of the WISC were thought to indicate a possible visual-motor integration deficit. A distinction was necessary at this point. However, a child may perform poorly on these tests not because he cannot reproduce forms but because of an inability to discriminate visual forms. A higher score on the Picture Completion subtest of the WISC, the Position in Space and Form Constancy subtests on the Frostig and the Visual Closure subtest on the ITPA would tentatively rule out visual perception as deficits and make the hypothesis of a visual-motor integration deficit more likely. A child may also have both types of deficits.

Low scores on the Picture Completion subtest on the WISC, the Position in Space and Form Constancy subtests of the Frostig, the ITPA Visual Closure subtest and the Coding subtest of the WISC, if the Picture Arrangement and Digit Span subtests and the Visual Sequential Memory subtest of the ITPA were consistently higher, were considered indicative of a visual perception problem(s).

The Figure Ground subtest on the Frostig, although generally considered a test of visual perception, is also a measure of distractibility. A low score on the Visual Closure subtest of the ITPA, plus a low Figure Ground score, and low scores for the combined Digit Span and Arithmetic subtests of the WISC, particularly in the older children, were considered substantiating areas of agreement for a hypothesis of distractibility and a possible reason for hyperactivity.

It was difficult to determine the relevance of several of the tests. For example, the Harris Test of Lateral Dominance did not seem to fit any category but was considered an additional clue that there was a disturbance in perceptual-motor development.

The Localization of Topographical Positions and Concept of Left-Right tests seem to be assessing the conceptual aspect of spatial knowledge. However, they also indicate needed areas of research, since a considerable number of these children appear to have irregular development in these abilities. The normal progression in acquiring a knowledge of left-right according to Laurendeau and Pinard (1970) is understanding left-right on one's own body, then on the body of a person opposite and finally as a relative notion. It was not uncommon for the children with perceptual-motor impairment to understand the first and third notions but not the second. Similarly, there was frequently a discrepancy in the sequence in which the concepts of left-right, top-bottom were acquired.

The Perceptual-Motor Match subtests of the Purdue were used to determine whether the child was having difficulty crossing the horizontal and vertical midlines of the body. The Ocular Control subtest seems to be a measure related to visual-motor integration and/or visual perception.

IV. Analysis of Social Data

Several tests were administered to assess social development: the California Test of Personality (Thorpe, 1953), Vineland Social Maturity (Doll, 1949), Activity Level (Ayres, 1965), and a test of egocentricity, The Piagetian Task - Coordination of Perspectives (Laurendeau & Pinard, 1970). Except for the assessment of activity level the data from these tests were not used directly for programming. The information from the activity level rating scale and general observation of the child were used to determine whether the child required a structured or unstructured program and whether behavior modification or precision teaching strategies were to be employed.

The tests did provide data which were used indirectly, for example, children with very low scores on the Vineland were given many opportunities for experience in self-care and verbalization, as well as interaction with other children. The children in general were taught in small group situations whenever possible but particular emphasis was placed on socializing the children who were unable to perform on the test of egocentricity.

V. Analysis of Academic Data

A. Academic Readiness Tests:

For the children with no measurable academic skills, readiness tests were administered, specifically the Metropolitan test of Reading Readiness (Hildreth, et al., 1964). The Metropolitan has potential for assessing readiness in several areas. The Word Meaning, Listening, Matching and Alphabet subtests along with the Total Readiness score were used as an indicator of reading readiness. The number subtest along with the Piagetian tasks of logico-mathematical concepts were used as a measure of readiness for formal instruction in arithmetic. The copying subtest proved valuable as a measure of readiness for handwriting.

Although the manual for the Metropolitan recommends that children who earn a score of C or average are ready for formal instruction in reading, the project directors chose to select B or above average as the standard. A score of C was considered by the project directors to indicate a need for an intensive readiness program while children scoring D or E were administered a program aimed at developing very basic concepts such as same, different, first, last, etc. Most of these children also required help in discriminating gross differences in color, sound, size, etc. They were unable to perform on even the most simple commercial programs such as the Thurstone Learning to Think program. Materials suited to their level had to be devised until such time as they were able to perform using more formal programs.

B. Diagnosis of Arithmetic Disabilities:

Number readiness was often behind reading readiness. For example, it was not uncommon for children to be "ready" for reading instruction or actually able to read, yet to score D or E in the Number and/or Copying subtests. Several patterns of functioning were found. The most common pattern was low verbal ability in general, and preoperational stage thinking for the Piagetian tasks. This type of child usually had overall academic deficiencies and/or borderline intelligence, although not always. For several children the problem seemed to be part of a general language problem. For several others the problem seemed to be lack of operational level thought for the Piagetian tasks in spite of mental age being in an appropriate range for operational level thinking to occur.

The most common pattern in number disability, however, seemed to be centered around a perceptual-motor syndrome of disability: low WISC spatial pattern scores, low ITPA visual-channel scores and splintered or very low functioning in the perceptual-motor areas in general. This profile was frequently accompanied by memory and/or sequencing problems in one or both channels. Young children manifesting the perceptual-motor disability syndrome were also preoperational, but below seven years preoperational thought is to be expected. Several of the older children manifesting the spatial disability and an arithmetic disability had acquired concrete operations but seemed unable to apply the concepts to acquire an understanding of arithmetic.

Frequently children with an arithmetic disability and a perceptual-motor disability also had difficulty with handwriting. The most usual characteristics of the handwriting disability were inability to write on a line, large and malformed letters,

letter (and number) reversals and words either running together with no regard for spacing, or uneven spacing. Similar difficulties were found also in spelling.

An arithmetic diagnostic test (Whyte, 1972) was administered to all the children in the study. The diagnostic test assessed four areas of understanding of the natural number system: counting, place value, computational skills and properties or laws of the system.

The most common problem was for a child to function at a rote level in computational skills but to understand little or nothing of the skills in the other three areas. Children able to add and subtract quite accurately and even to perform simple multiplication and division, quite often possessed an incomplete understanding of counting concepts at a grade one level, e.g., "Is 70 less than, more than or equal to 71?"; "What numbers come just before and after 29?". They did not understand even the most basic laws of the natural number system. Place value was a particular problem area. Frequent errors were found in writing numbers (e.g., 400803 was produced for 483), and in understanding of number values within a number (e.g., "What does the first 4 in 44 stand for?"). Acquiring basic addition, subtraction and multiplication facts is also particularly difficult for these children.

Finally, experience taught the project directors that, as a general rule, understanding of one-to-one correspondence on the conservation of number task seemed necessary for beginning counting concepts. Operational thinking in conservation of number and class inclusion appeared necessary for teaching understanding of basic addition (and subtraction) concepts such as $7 = 6 + 1$, $5 + 2$, $4 + 3$, $3 + 4$, $2 + 5$, $1 + 6$. Before children gained any understanding of "relational concepts" operational thinking in seriation appeared to be necessary. Examples of such concepts include: If $4 + 3 = 7$, then $7 - 4 = 3$; If $6 \times 2 = 12$, then $12 \div 2 = 6$; If $16 - 7 = 9$, then $16 - 8 = 8$ because 7 is one less than 8, therefore 9 will be one more than the answer to $16 - 8 = 8$.

C. Diagnosis of Reading Disabilities:

Reading disabilities were found more commonly in word attack than comprehension skills, although several children were able to word-call quite fluently but understood little or nothing of what they read. Diagnosis of reading disability took two forms: diagnosis of actual reading errors and assessment of basic skills thought to be necessary for acquiring the ability to read. The Doren Diagnostic Reading Test (Doren, 1956) and the Roswell-Chall test for phonetic sounds (Roswell and Chall, 1963) were used for the former purpose when scores on the Stanford Achievement Test indicated there was a need for further assessment. Both these tests were valuable for pin-pointing exact areas of difficulty in word-attack skills such as difficulty with phonetic blends, or the rule for silent e, or difficulty in discriminating between short vowel sounds. A less formal checklist was employed in determining presence or absence of specific comprehension skills.

The ITPA and Frostig test results were among the more valuable sources of information for pin-pointing patterns of deficit and strength for basic reading abilities. Disabilities at the automatic-sequential level on the ITPA were very common among children with reading difficulties. Several patterns emerged, e.g., sequential memory deficits, particularly auditory; relatively lower scores in the auditory channel than the visual channel, in Auditory Sequential Memory and

Auditory Closure, and occasionally in Sound Blending and Auditory Discrimination (Wepman); relatively lower scores in the visual channel in Visual Closure and Visual Sequential Memory accompanied by one or more areas of deficit on the Frostig. Low Visual Closure scores tended to be accompanied by a relatively lower score in Figure Ground. A discrepant score in WISC Picture Completion tended to accompany low scores on the Frostig Position-in-Space and less often in Form Constancy and Eye-Motor coordination. A low WISC sequencing pattern was very often accompanied by low scores in ITPA Auditory and Visual Sequential Memory.

The diagnostic tests were also valuable for pointing out areas of strength. For example, an indication of a visual channel deficit but an auditory channel strength (or vice versa) was valuable for determining the type of reading program to be employed.

As the study progressed, the project directors became more aware of patterns of disability across categories of tests, consequently, later programming probably became more accurate.

INTERPRETING PSYCHOEDUCATIONAL ASSESSMENT DATA

To clarify the procedure followed in interpreting the data, a number of questions aimed at "teasing out" information were asked. The questions are discussed in this section and test information is employed to demonstrate the interpretation process.

1. *Interpreting Intellectual Test Scores:*

The following are questions the clinician can ask as a guideline for interpretation of intellectual test data:

1. Is there a significant difference between WISC verbal and performance IQ scores (more than 15 points)?
2. Are WISC verbal IQ and Stanford Binet scores comparable, that is, within the same range?
3. Are the IQ scores in the above average (IQ above 110), average (90 to 110), borderline (75 to 90), or retarded range (less than 75)?
4. In what range of functioning are the Block Design, Similarities and Vocabulary subtest scaled scores: superior (more than 12), average (9 to 12), borderline (7 to 8), retarded (less than 7)? Do one or more of the three subtest scores indicate more potential than is indicated by the gross IQ scores? Do the subtest scores differ by verbal level (Similarities and Vocabulary) and performance level (Block Design)?
5. If the Vocabulary scaled score is lower than Similarities, what is the child's home background like? How are words being defined: by use or characteristic, or by class? How does the Vocabulary score (defining ability) compare with receptive or listening vocabulary (see Peabody Picture Vocabulary Score)?
6. How does functioning differ in the patterns suggested by Bannatyne:
 - a. Conceptualization - Comprehension + Similarities + Vocabulary;
 - b. Spatial - Block Design + Object Assembly + Picture Completion;
 - c. Sequencing - Digit Span + Coding + Picture Arrangement;
 The ranges of functioning for the patterns are: superior (more than 36), average (24 to 36), retarded (less than 24).
7. In a discrepant pattern(s), is/are the scores within the pattern homogeneous? Clues to look for are:
 - a. Conceptualization pattern—homogeneous low scores may indicate retardation, language disability, hearing disability, cultural deprivation. If retardation is the problem, the profile of scores for the test overall is generally low particularly in verbal areas, and narrow in range with somewhat better functioning in performance areas. The child also tends to be preoperational, particularly in classification and seriation.

Hearing impaired and language disabled children tend to have low scores in most verbal areas. All children with low verbal scores should have a complete audiological assessment. If there is a language disability,

other problems will emerge. These problems will be discussed in a following section under language functioning.

- b. Spatial pattern – Are both Block Design and Object Assembly scores discrepant (either higher or lower) from Picture Completion? Low Block Design and Object Assembly scores seem to indicate poor visual-motor organization or integration, therefore, pay particular attention to Bender Gestalt Test performance. Look at the figures for distortion, separation, rotation errors. Low Picture Completion scores tend to be associated with visual perception problems such as are measured by the Frostig DTVP.
- c. Sequencing pattern – Test performance can vary in several ways in this pattern. Overall low scores seem to be associated with memory and/or sequencing problems. If memory is thought to be the problem, compare the memory/sequencing scores with ITPA memory/sequencing test results. Determine whether elements in the sequence are forgotten. If so, a memory deficit is a viable hypothesis. Are elements in the series remembered but incorrectly sequenced? If so, sequencing but not memory is probably the problem. Does the child perform better on the auditory sequencing test on the ITPA? If so, it may be an attention deficit, with the stronger stimulus (more rapid presentation of digits) on the ITPA producing better attention and better results.

Are scores for Digit Span and Coding higher or lower than the Picture Arrangement score? The former seem to be assessing short term, non-meaningful memory/sequencing and the latter, meaningful memory/sequencing. Is Digit Span a discrepantly low score in the pattern? If so, check ITPA Auditory Sequential Memory score. Is Coding a discrepantly low score in the pattern? If so, check ITPA Visual Sequencing Memory Score. If Coding is the only discrepantly low score in the WISC sequencing pattern, the problem may be visual-motor integration and may also be reflected in performance on the Frostig Eye-Motor Coordination subtest and the Bender Gestalt test.

8. Particularly in children over nine years, are both Digit Span and Arithmetic subtest scores discrepantly lower than the remaining verbal scores? If so, hyperactive, distractible behavior, generally associated with arithmetic disability and visual-motor integration problems tend also to be found.
9. Is low verbal functioning also accompanied by a low Picture Arrangement score? This pattern tends to be associated with language problems and/or preoperational level thought.
10. Is poor functioning on the WISC performance subtests accompanied by a low Arithmetic score on the verbal subtests? This pattern tends to be associated with arithmetic disability and spatial-motor problems.
11. Are low verbal scores (with performance scores in the normal range) associated with preoperational level thought in children older than nine years? Both may be due to verbal abstracting disabilities and/or language problems.

12. Are children older than nine years functioning at a preoperational level on Piagetian tasks, but scoring within normal range on IQ tests? Such children are occasionally found and, in the author's clinical experience, invariably are having difficulty with academic subjects.

To demonstrate the application as well as the value of the WISC for diagnostic purposes, several case studies will be discussed. (The Christian names used in each case study are not the child's actual name.)

EXAMPLE 1: ERNIE, C.A.: 7-10

Stanford Binet - M.A.: 6-10; IQ: 84

WISC Verbal IQ: 75; Performance IQ: 80

<i>Verbal Subtests*</i>		<i>Performance Subtests</i>	
Information	7	Picture Completion	11
Comprehension	8	Picture Arrangement	6
Arithmetic	5	Block Design	4
Similarities	4	Object Assembly	7
Vocabulary	6	Coding	8
Digit Span	5		

(*Subtest data are presented as scaled scores.)

Measures of "g" or general intelligence: Similarities (4), Vocabulary (6), Block Design (4)

WISC patterns:

- (1) Conceptualization: Comprehension (8) + Similarities (4) + Vocabulary (6) =
8 + 4 + 6 = 18
- (2) Spatial: Picture Completion (11) + Block Design (4) + Object Assembly (7)
= 11 + 4 + 7 = 22
- (3) Sequencing: Digit Span (5) + Coding (8) + Picture Arrangement (6) = 5 +
8 + 6 = 19

Distractibility Index: Arithmetic (5) + Digit Span (5)

Logico-Mathematical Tasks (*stage):

Multiplication of Classes:	3
Inclusion of Classes:	2
Conservation of Number:	1
Conservation of Length:	1
Seriation:	Unable to perform on this task

(*Stage 3 is concrete operational thought; less than stage 3 is preoperational level thought.)

Analysis:

There is no discrepancy between verbal and performance IQ, and both are in the mildly retarded range. The better indices of *g* – Similarities, Vocabulary and Block Design – are also within the retarded range. Except for Information and Comprehension, verbal scores are in the retarded range and homogeneous (4 to 6). Picture Arrangement at 6 and Block Design at 4 also support an hypothesis of mild retardation. Non-verbal functioning (Performance IQ) is somewhat higher than verbal functioning but one subtest (Picture Completion at 11) is the only discrepant score. Concrete operational thought has been initiated but only in one area, multiplication of classes (stage 3). There are discrepancies within the three WISC patterns. Receptive vocabulary (PPVT Mental Age, 6-8) is also within the retarded range. Tentative hypothesis – mild retardation with some splintering of strengths and deficits across spatial-motor and language areas.

EXAMPLE II: CATHERINE, C.A.: 9-0

Stanford Binet – M.A.: 7-8; IQ: 81

WISC Verbal IQ: 81; Performance IQ: 114

<i>Verbal Subtests</i>		<i>Performance Subtests</i>	
Information	4	Picture Completion	11
Comprehension	4	Picture Arrangement	16
Arithmetic	9	Block Design	14
Similarities	12	Object Assembly	11
Vocabulary	7	Coding	8
Digit Span	6		

Measures of "g" or general intelligence: Similarities (12), Vocabulary (7), Block Design (14)

WISC patterns:

- (1) Conceptualization: Comprehension (4) + Similarities (12) + Vocabulary (7)
= 4 + 12 + 7 = 23
- (2) Spatial: Picture Completion (11) + Block Design (14) + Object Assembly (11) = 11 + 14 + 11 = 36
- (3) Sequencing: Digit Span (6) + Coding (8) + Picture Arrangement (16) = 6 + 8 + 16 = 30

Distractibility Index: Arithmetic (9) + Digit Span (6)

Logico-Mathematical Tasks (stage):

Multiplication of Classes:	2
Inclusion of Classes:	2
Conservation of Number:	3 Concrete Operational Period
Conservation of Length:	3
Seriation:	2-3 Transitional

Analysis:

Diagnosed as mentally retarded, Catherine has been in an opportunity classroom for two years. When the project began, she was achieving academically at a grade one level. She was absent from school for weeks at a time for a chronic illness.

It was obvious she was not a retarded child, although Stanford Binet and WISC verbal IQ's were within the borderline range. There is a very discrepant 33-point spread between verbal and performance IQ. Two of the better indices of g - Similarities and Block Design - are within the superior range but Vocabulary at 7 is borderline and the PPVT mental age of 7-1 indicates receptive vocabulary is also low.

The conceptualization pattern ranges from retarded to superior functioning. The sequencing pattern points to a possible disability in non-meaningful short term memory and/or sequencing in both channels. (Auditory Sequential Memory and Visual Sequential Memory on the ITPA were 4-10 and 5-10 respectively and supported the hypothesis of a memory/sequencing deficit.) The scores in the distractibility index are not discrepant from the other verbal scores. Catherine is operational on tests of number concepts but preoperational in logical thinking skills. Tentative hypothesis: a severe learning disability for most verbally presented materials with some splintering of language skills (the P.L.A. or average language age on the ITPA was 6-8). Sequencing and/or memory for short term non-meaningful material is a serious area of deficit in both channels. Meaningful memory and sequencing are areas of strength as are spatial-motor and perceptual functioning. (This hypothesis was substantiated by the remainder of the testing.)

EXAMPLE III: ANDREW, C.A.: 6-7

A child with cerebral palsy, Andrew was immediately categorized as mentally retarded and placed in an opportunity classroom. Pre and posttest scores are presented to indicate the seriousness of stereotyping children. He was extremely hyperactive. Posttest scores are presented in parentheses.

Stanford Binet - M.A.: 5-8 (6-10); IQ: 82 (94)

WISC Verbal IQ: 84 (91); Performance IQ: 86 (99)

Verbal Subtests

Information	10 (9)
Comprehension	7 (9)
Arithmetic	7 (6)
Similarities	6 (13)
Vocabulary	7 (9)
Digit Span	5 (6)

Performance Subtests

Picture Completion	12 (17)
Picture Arrangement	10 (6)
Block Design	4 (7)
Object Assembly	6 (8)
Coding	Could not be administered at pretest (posttest 11)

Measures of "g": Pretest – Similarities (6), Vocabulary (7), Block Design (4);
Posttest – Similarities (13), Vocabulary (9), Block Design (7)

WISC Patterns:

Conceptualization pattern: $7 + 6 + 7$ ($9 + 13 + 9$)

Spatial pattern: $12 + 4 + 6$ ($17 + 7 + 8$)

Sequencing pattern: $5 + \text{NA} + 10$ ($6 + 11 + 6$)

Logico-Mathematical Tasks (stage):

Multiplication of Classes:	2 (3)
Inclusion of Classes:	0-1 (1)
Conservation of Number:	1 (1)
Conservation of Length:	2 (2)
Seriation:	0 (1)

Analysis:

The Stanford Binet IQ (82) and WISC verbal (84) and performance (86) IQ's are within the borderline range of intelligence. There is no significant difference between WISC verbal and performance IQ but there is significant scatter within both areas. The conceptualization pattern $7 + 6 + 7$ is homogeneous and borderline. The sequencing pattern is irregular as is the spatial pattern. This appears to be due partly to his hyperactive behavior and partly to the nature of his physical disability. Operational thinking has not been initiated at pretest, but is not expected at C.A. 6-7.

Because it seemed likely that test scores were artificially depressed at pretest, the emphasis in programming was placed on building skills necessary for performing in learning situations, e.g. control and manipulation of materials and development of attending skills. To reduce hyperactive and distractible behavior, very structured programs were utilized. Both the physical environment and the instructional programs were highly structured. Emphasis was placed on improving conceptualizing abilities.

The posttest scores probably present a more accurate picture of Andrew's ability. At this time, conceptualization ability is within normal limits. Sequencing is still irregular and in need of remediation. There is a deficit in spatial organization ability. Now that learning skills have improved, less structure is required, and emphasis can be placed on developing logical thinking skills.

At the time of posttesting, Andrew was integrated in a regular grade one class and his special needs were attended to by a resource teacher for learning disabled children. This case illustrates the need for flexibility in interpretation of psychometric data. By following the dictates of common sense and observation skills supplemented by psychometric data, Andrew's functioning improved. With improvement in learning skills, psychometric data become more accurate and valuable for later programming.

II. Interpreting Language Data:

Because verbal functioning on intelligence tests often closely resembles language functioning, data from intellectual tests is an important part of a language diagnosis. In determining the nature of a language disability, the clinician must, therefore, integrate the two sources of data.

The literature indicates that children may have language dysfunction(s) in the following areas:

A. Disabilities due to imperception:

1. Auditory discrimination - inability to discriminate sounds
2. Auditory closure - inability to take an incomplete or distorted stimulus word and determine what the word is by making a "good" match, for example, re-ig-ator = refrigerator, or a word in an accent unlike the accent the child is used to hearing cannot be coded so that he can recognize the word
3. Sound blending - inability to sound out words and then to blend the parts into an integrated whole
4. Reauditorization of sounds or words - inability to remember the sound made by a letter when the letter is presented visually, or the inability to transduce the visual symbol for a word to the auditory even though he knows its meaning

B. Disabilities related to comprehension of language:

1. Reception - the child receives very little information from what he hears and/or sees

2. Processing – he cannot process information which he receives visually and/or auditorially
3. Expression – he cannot express himself vocally and/or manually
4. Vocabulary – (a) the repertoire of word labels for listening and/or speaking is inadequate for his age level;
 - (b) listening comprehension is adequate but he is unable to define words adequately for his age level;
 - (c) defining ability is immature for his age level, that is, instead of defining a word by class he defines by characteristic or function, e.g., an orange is to eat or an orange has juice, rather than orange is a fruit or a color.

The following questions are intended to determine whether there are deficits of language in the areas outlined above.

1. Is there any evidence of a language disability in the intellectual data? If so, what is the nature of the evidence?
 - a. Retarded verbal but normal nonverbal functioning?
 - b. Discrepantly low scores in Vocabulary, Similarities and/or Comprehension?
 - c. If Vocabulary is the discrepant score, what is the home background like, that is, is there a paucity of vocabulary experiences available to the child? Is the child's receptive vocabulary as measured by a picture vocabulary test such as the PPVT also retarded? How are words being defined, by use or characteristic or class? Can he use concrete words but not abstract words? Compare vocabulary scores with receptive language on the ITPA and with vocal expression on the ITPA. Tracing the source of the problem will indicate avenues for remediation.
 - d. If Similarities is the low score, is the ITPA Auditory-Vocal Association score also low? Are Block Design and Visual-Motor Association scores low? The former may be the result of a deficit in verbal abstracting or processing ability and the latter of nonverbal abstracting or processing ability. If Similarities is the low score and is due to a deficit in abstracting ability, the Comprehension score will probably also be low. However, Comprehension may be low because of poor memory for verbally presented material, or lack of social experiences.
 - e. Is there a sequencing and/or memory deficit for meaningful and/or nonmeaningful material? Is the deficit in the auditory and/or visual channels(s)? Compare WISC scores with ITPA Auditory and Visual Sequential Memory.
2. Does a pattern of abilities and disabilities emerge from the ITPA scores? There are several possible patterns:
 - a. difference by level;
 - b. difference by channel at one or both levels;

- c. difference by process: reception, association or expression at the representational level; closure or memory at the automatic-sequential level.
3. If Auditory Closure and/or Sound Blending Scores on the ITPA are low, is there a problem with auditory discrimination (see Wepman error score)? If there are any problems in auditory language, hearing should be assessed. If the Visual Closure score is low, is there a problem with visual perception and/or visual-motor integration?

To demonstrate the interpretation of language data, several case studies will be discussed.

EXAMPLE 1: CATHERINE, C.A.: 9-0

Catherine has been discussed in the previous section, the tentative hypothesis: a severe learning disability for most verbally presented material with some splintering of language skills, and a serious deficit of sequencing and/or memory for non-meaningful material. Posttest scores are presented in parentheses.

Language Data:

PPVT (Peabody Picture Vocabulary Test): M.A. 8-10; IQ: 90

Wepman Auditory Discrimination Test: 2 X errors; zero Y errors

ITPA-P.L.A.: 6-8 (7-11)

Automatic-Sequential Level

	<i>Auditory</i>	<i>Visual</i>
Memory	4-10 (5-6)	5-10 (8-4)
Closure		7-6 (7-0)
Auditory Closure	6-9 (7-3)	
Sound Blending	8-2 (8-7)	
Grammatic	5-8 (7-11)	

Representational Level

	<i>Auditory</i>	<i>Visual</i>
Reception	7-6 (9-6)	7-4 (8-4)
Association	7-0 (7-8)	7-7 (8-5)
Expression	6-8 (8-4)	5-10 (8-8)

Analysis:

The language deficit is pervasive but particularly severe at the Automatic Sequential level and for sequential memory in both channels. Although

spatial-motor ability is normal, the visual language channel is deficient. (The Purdue, Frostig, Draw-A-Man, and Bender Gestalt test results are at or above levels expected for the C.A. level 9-0, she is completely right dominant and operational on the representational space tasks). Receptive vocabulary as measured by the PPVT is also borderline for her age level.

Remediation was centered around developing language skills, and bringing logico-mathematical concepts to the concrete operational level through the arithmetic program followed. IQ scores remained essentially as they were but generalization of the conservation concept was extended. The P.L.A. (average ITPA score) increased by one year three months with the greatest increases occurring in Grammatic Closure (a gain of two years three months, that is 2-3), Vocal and Motor Expression (1-8 and 2-10 respectively), Visual Sequential Memory (a gain of 2-6), and Auditory Reception (2-0). Other areas where scores increased were Visual Reception (1 year), Auditory-Vocal and Visual-Motor Association (8 and 10 months respectively). Auditory Memory increased from 4-10 to 5-6. Reading comprehension increased from grade 1.9 to 2.6, a gain of seven months, and arithmetic counting concepts and understanding of properties of the natural number system also increased substantially, indicating that improved conceptual and language skills could also be used in an applied situation.

EXAMPLE II: MALCOLM, C.A.: 9-1

Because Malcolm's intellectual data were not presented in the previous section, they are presented here. Posttest scores are presented in parentheses.

Intellectual Data:

Stanford Binet: M.A.: 7-4 (7-10); IQ: 77 (79)

WISC: Verbal IQ: 74 (91); Performance IQ: 89 (94)

<i>Verbal Subtests</i>		<i>Performance Subtests</i>	
Information	6 (9)	Picture Completion	10 (14)
Comprehension	5 (10)	Picture Arrangement	5 (7)
Arithmetic	7 (5)	Block Design	10 (10)
Similarities	5 (11)	Object Assembly	13 (10)
Vocabulary	6 (8)	Coding	4 (5)
Digit Span	6 (5)		

Measures of g: Similarities (5), Vocabulary (6), Block Design (10)

WISC patterns:

(1) Conceptualization: Comprehension (5) + Similarities (5) + Vocabulary (6) =
 $5 + 5 + 6 = 16$

(2) Spatial: Picture Completion (10) + Block Design (10) + Object Assembly (13) = 10 + 10 + 13 = 33

(3) Sequencing: Digit Span (6) + Coding (4) + Picture Arrangement (5) = 6 + 4 + 5 = 15

Distractibility Index: Arithmetic (7) + Digit Span (6)

Logico-Mathematical Concepts (stage):

Multiplication of classes:	2 (2)
Inclusion of classes:	3 (3)
Number conservation:	3 (3)
Seriation:	1-2 (2)

Language Data:

PPVT M.A. 7-6 (7-3); IQ: 86 (79)

Wepman Auditory Discrimination Test: 14 x errors; 1 y error

ITPA-P.L.A.: 6-9 (7-10)

Automatic-Sequential Level

	<i>Auditory</i>	<i>Visual</i>
Memory	5-3 (6-6)	6-2 (7-10)
Closure:		7-6 (9-4)
Auditory	6-1 (6-5)	
Sound Blending	6-5 (8-7+)	
Grammatic	6-0 (7-11)	

Representational Level

	<i>Auditory</i>	<i>Visual</i>
Reception	5-0 (6-8)	9-3 (8-10)
Association	7-0 (9-2)	8-0 (8-5)
Expression	7-0 (5-8)	7-6 (10-4+)

Analysis

The WISC scores indicate a possible verbal deficiency and sequencing deficit: Performance IQ higher than Verbal IQ by 15 points; conceptualization pattern: 5 + 5 + 6; sequencing pattern: 5 + 5 + 7 (both patterns are in educable mentally retarded range). Further testing in spatial development indicated motor functioning was immature, visual perception was retarded and the Draw-A-Man and Bender Gestalt scores were 63 and 38 respectively (more than two S.D. below average). Malcolm is also explosive, aggressive, distractible and easily frustrated. Operational thought is initiated in two areas.

The following pattern of language functioning is interpreted from the data:

1. Except for Visual Reception, there is an overall language deficit.
2. Although both levels are involved, the disability is particularly severe at the Automatic-Sequential level.
3. The visual channel at the Representational level is a relative strength.
4. There is a closure deficit, particularly severe in the auditory channel; auditory discrimination is also an area of deficit.
5. There is a severe sequential-memory deficit in both channels.
6. Auditory Reception at 5-0 is the lowest score, indicating very little information is being acquired from what is heard. Hearing was assessed and is normal. Hypothesis: the most serious problem is the lack of information being received through the auditory channel, possibly caused or aggravated by very poor auditory memory, closure, and discrimination. Priority: to improve these basic areas of language disability.
7. Strangely, operational thought is developing well in most areas and this is considered an asset, as well as indicating normal intellectual potential.
8. A perceptual-motor program was planned and administered concurrently with the language program. This program will be considered in the following section. The results of the remediation program were positive and substantial. There was transfer to other verbal areas: (1) WISC verbal scores: Verbal IQ, 74 to 91; Information, a gain in scaled score from 6 to 9; Comprehension, 5 to 10; Similarities, 5 to 11; Vocabulary, 6 to 8; (2) WISC Picture Arrangement (which appears to be related closely to verbal skills) increased from 5 to 7; (3) the WISC conceptualization pattern increased from 5 + 5 + 6 (retarded functioning) to 10 + 11 + 8 (normal functioning). ITPA scores also increased: (1) P.L.A. from 6-9 to 7-10, a gain of 1 year 1 month; (2) ITPA Automatic-Sequential subtest scores increased as follows:

Auditory-Sequential Memory: 5-3 to 6-6, a gain of 1 year 3 months or (1-3);

Visual Sequential Memory: 6-2 to 7-10 (a gain of 1-8);

Visual Closure: 7-6 to 9-4 (a gain of 1-10);

Auditory Closure: 6-1 to 6-5 (4 months);

Sound Blending: 6-5 to 8-7+ (upper limit for test);

Grammatic Closure: 6-0 to 7-11 (a gain of 1-11).

There was transfer to representational level subtest scores: Auditory Reception, 5-0 to 6-8; Auditory-Vocal Association, 7-0 to 9-2; Visual Motor Association, 8-0 to 8-5; Motor Expression, 7-6 to 10-4+ (upper limit). Auditory discrimination ceased to be a problem area, and there was transfer to phonetic word attack skills.

III. *Interpreting Spatial Data:*

One of the major problems in interpreting perceptual-motor data is the difficulty in sorting out what the tests are assessing. For the purposes of this study, it was assumed four major areas of functioning were being assessed:

1. Motor: balance, posture, movement, body awareness, coordination of both sides of the body, ocular control

2. Visual-motor integration

3. Visual perception: position in space, visual discrimination of detail, closure, form recognition

4. Cognitive space: concept of opposition of left and right, projective relations

The following outline indicates the rationale underlying the interpretation of tests administered in the present study:

<i>Area of Functioning</i>	<i>Specific Skills Involved</i>	<i>Tests thought to be Measuring the Skill</i>
I. Motor	1. balance, posture and movement 2. body awareness	Purdue: Balance and Posture Concept of left and right; Purdue: Body Image; Draw-A-Man Test
	3. coordination of both sides of the body	Purdue: Perceptual Motor Match
	4. ocular control	Purdue: Ocular Control
II. Visual-Motor Integration	1. eye and hand control and coordination	Bender Gestalt; Purdue: Form Perception; Frostig: Eye-Motor Coordination; Spatial Relations
	2. motor planning	Draw-A-Man; WISC: Block Design, Object Assembly
	3. form reproduction	Purdue: Form Perception; Draw-A-Man; Bender Gestalt; WISC: Block Design
III. Visual Perception	1. position in space	Frostig: Position in Space; WISC: Picture Completion ITPA: Visual Sequential Memory (rotations and reversals of elements)
	2. closure	Frostig: Figure Ground; ITPA: Visual Closure
	3. form recognition	Frostig: Form Constancy
IV. Cognitive Space	1. concept of opposition of left and right	Concept of Left and Right
	2. projective relations of left-right, before-behind	
	(a) elementary	Localization of topographical positions
	(b) advanced	Coordination of perspectives

The WISC often provides the first psychometric clue to a possible spatial deficit, but the alert teacher can detect symptoms from classroom and playground behavior: clumsy and awkward behavior, difficulties with handwriting, difficulty in arranging work on a page. In teasing out particular patterns of deficit and strength from psychometric data, the project directors asked questions such as the following:

1. Is the WISC verbal IQ significantly higher than the performance IQ (more than 15 points)?
2. Is there scatter on the performance subtests? Does the spatial pattern, in whole or part, differ significantly from the conceptualization and/or sequencing pattern(s)? Block Design and Object Assembly, particularly in combination, are good measures of spatial organization ability. Low scores on the Picture Completion subtest are frequently accompanied by low scores on the Frostig, particularly the Position in Space test. Block Design and Object Assembly seem to be assessing visual-motor integration. Koppitz (1971) concluded that visual-motor integration deficits and visual perception deficits can occur in combination but frequently occur in isolation. The division Block Design and Object Assembly, and Picture Completion frequently indicates the area of disability — spatial organization or visual perception.
3. If the problem is a motor disability, what are the manifestations? Poor performance on the Balance and Posture subtest on the Purdue indicates difficulty with body movement. Frequently such children avoid playground activities. Does the child seem unaware of his body parts, what they can do, and the space they occupy? Low scores on the Body Image and Differentiation subtest of the Purdue and the concepts of Left and Right test suggest this type of difficulty. The Draw-A-Man test, while involving other types of information as well, is also a measure of the child's knowledge of his body. Can he coordinate both sides and the top and bottom of his body? The Perceptual Motor Match subtest on the Purdue is useful in detecting these types of problems.
4. Lack of ocular control seems to be involved in motor and/or perceptual-motor disabilities. In the present study this information was considered along with telebinocular information, and hypothesized tentatively to be part of the basic problem underlying visual perception problems.
5. Does the child have difficulty in managing paper and pencil, gliding smoothly from line to line when reading, arranging arithmetic problems on a page, or reproducing figures? Are letters malformed and irregular in size? These characteristics appear to be manifestations of a visual-motor integration problem. The clinician's task is to determine whether the problem is one of

reproduction and integration or a deficit in recognition of form. Visual-motor integration problems are reflected primarily in low scores on the Bender Gestalt and other copying tests such as Form Perception on the Purdue and the Copying subtest of the Metropolitan Readiness test. Scores on the Frostig Eye-Motor Coordination and Spatial Relations subtests may also be low. If figures on the Bender Gestalt are not reproduced correctly, check Form Constancy on the Frostig DTVP. The latter involves recognition of form, and if there is discrepant performance on the Form Constancy and Bender Gestalt tests, with higher performance on the former, reproduction (or visual-motor integration) rather than visual perception is likely the area of deficit. Motor planning is involved in visual-motor integration. WISC Block Design and Object Assembly, and Draw-A-Man tests also involve motor planning.

6. Are there manifestations of visual perception problems? Position in Space problems, manifested by rotation and inversion of letters and numbers, generally are reflected in a low score on the Frostig Position in Space test and indirectly on the ITPA Visual Sequential Memory subtest by rotation and inversion of the elements. Closure problems generally are reflected in low Figure Ground and Visual Closure scores. Form Constancy has been discussed under number 5.
7. Frequently the child understands space at a cognitive level, even though he cannot handle space at a practical level. This distinction can be made by observing the stage of development on the representational space tasks.
8. Finally, perceptual-motor problems carry over to the visual channel of language. This seems to be particularly true when ITPA auditory scores are much higher than visual scores.

To demonstrate the interpretation of spatial data, a case study will be discussed.

EXAMPLE 1: MALCOLM, C.A.: 9-1

Malcolm was also discussed in the section on language functioning. While the primary problem was thought to be in language functioning, there was also an involvement in perceptual-motor functioning and a program in this area was administered concurrently with the language program. Posttest scores are presented in parentheses.

Perceptual-Motor data:

Purdue Perceptual Motor Survey:

Balance and Posture	3 to 4 (3 to 4)
Body Image	3 (3 to 4)
Perceptual-Motor Match	3 (3)
Ocular Control	3 (3)
Form Perception	2 to 3 (3)

Harris Test of Lateral Dominance: He is completely right dominant.

Representational Space (stage):

Localization of Topographical Positions: 3B (3B)

Concepts of Left and Right: 1B (1B)

Frostig, DTVP:

Eye-Motor Coordination	7-0 (6-9)
Figure Ground	5-9 (8-3: upper limit)
Form Constancy	9-0 (upper limit remained at 9-0)
Position in Space	5-6 (8-9: upper limit)
Spatial Relations	7-6 (8-3: upper limit)
ITPA: Visual Closure	7-6 (9-4)
Draw-A-Man:	63 (72)

Bender Gestalt Test: 38 – with distortion and separation errors (61)

Analysis:

1. The WISC spatial pattern is normal and homogeneous. Visual Sequential Memory and Closure (ITPA) are retarded: 6-2 and 7-6 respectively. Functioning in the visual channel at the representational level (ITPA) is close to normal, although Motor Expression is 7-6.
2. There is immature and splintered functioning on the Purdue tests with Form Perception the most serious deficit.
3. Lateral dominance is normal and representational space is at expected level for C.A.
4. The Draw-A-Man test drawing was immature with little detail.
5. The Bender Gestalt figures were large, malformed, with separation of parts.
6. Except for Form Constancy (recognition of forms) visual perception was an area of deficit.

Spatial development at a cognitive level appears to be normal as does Form Constancy or ability to recognize form. These two abilities probably account for the WISC spatial pattern being within normal limits.

The areas of deficit appear to be motor development, visual-motor integration and two areas of visual perception – position in space and closure. A motor remediation program (Chaney and Kephart) was administered, while visual-motor integration and visual perception were remediated by administering the Fitzhugh Spatial Organization Series: 101, 102, and 104. The results were not as substantial as in the language areas but several gains were made: (1) WISC performance IQ increased from 89 to 94, with increases in Picture Completion, Picture Arrangement and Coding; (2) ITPA: Visual-Motor Association increased from 8-0

to 8-5, Motor Expression from 7-6 to 10-4+, Visual Closure from 7-6 to 9-4. Frostig DTVP subtests all increased to upper limits: Figure Ground, 5-9 to 8-3; Position in Space, 5-6 to 8-9; Spatial Relations, 7-6 to 8-3. The Draw-A-Man IQ score increased from 63 to 72 and the Bender Gestalt from 38 to 61. Except for slight changes in Form Perception, Purdue scores remained unchanged, as did the DTVP, Eye-Motor Coordination score.

IV. Interpreting Social Data:

Although social data were used primarily to measure transfer of skills, several sources of information did appear useful for programming. For several children with limited social skills and social judgement, a WISC pattern emerged—low scores on the Comprehension and Picture Arrangement subtests. Stage 0 or 1A (egocentric functioning) on the test, Coordination of Perspectives, was found almost invariably for children unable to play or work with other children and who tended to seek and require adult assistance more than other children.

The activity level scale was useful in sorting out the hypoactive from the hyperactive, and in differentiating the hyperactive into groups. The scale looked at motor activity, speech, interference with others and emotional reactions to frustrations. Children whose problems were distractible, driven behavior tended to be most hyper in motor activity and sometimes speech and explosive reactions to frustration in work and play, whereas hyperactive children not exhibiting the spatial-motor, visual integration syndrome tended more towards attention-seeking and interference with others. The former tended to respond to a structured physical environment and to manifest visual-spatial deficits, particularly in visual-motor integration. The latter responded more readily to behavior modification techniques.

The Vineland Scale indicated children who required improvement in social skills, but also offered a sequence for remediation appropriate to various mental age levels. Examples of interpretation of social data will be considered in the chapter on psychoeducational programming.

V. Interpreting Academic Data:

The analysis of academic functioning level brought together data from all other areas. The analysis consisted of two stages:

1. Analysis of skills thought to be prerequisite – intellectual, perceptual-motor, language.
2. Diagnosis of the manner in which academic content was processed.

In the first instance, three broad types of profiles emerged: (a) narrow, pervasive and below expected levels in all areas and typical of the mentally retarded and culturally deprived; (b) high and low scores in specific areas, for example, poor language functioning but normal perceptual-motor functioning, or vice versa; (c) splintered deficits and strengths within and across areas of functioning.

In the second instance, difficulties might be present in one academic area, but not others, e.g. reading or arithmetic, or in one facet of a subject such as word attack skills or reading comprehension. More common was the child with difficulties in all academic areas. Since the academic programming involved

integrating data from all areas of functioning, an example will be cited to clarify the procedure followed.

EXAMPLE I: BOBBY, C.A.: 10-0

Bobby was typical of the children placed in opportunity classrooms because of underachievement. The Stanford Binet M.A. at 8-2 and IQ at 80 place him in the borderline range of intelligence, however, the WISC verbal and performance IQ's are 104 and 108 respectively, well within the normal range. The intellectual data are presented below:

WISC: Verbal IQ: 104; Performance IQ: 108

<i>Verbal Subtests</i>		<i>Performance Subtests</i>	
Information	10	Picture Completion	12
Comprehension	13	Picture Arrangement	11
Arithmetic	8	Block Design	12
Similarities	10	Object Assembly	12
Vocabulary	12	Coding	9
Digit Span	10		

Measures of "g": Similarities (10), Vocabulary (12), Block Design (12)

WISC Patterns:

(1) Conceptualization: Comprehension (13) + Similarities (10) + Vocabulary (12)
= 13 + 10 + 12 = 35

(2) Spatial: Picture Completion (12) + Block Design (12) + Object Assembly (12) = 12 + 12 + 12 = 36

(3) Sequencing: Digit Span (10) + Coding (9) + Picture Arrangement (11) = 10 + 9 + 11 = 30

Distractibility Index: Arithmetic (8) + Digit Span (10)

Logico-Mathematical Concepts (stage):

Multiplication of classes:	1-2
Inclusion of classes:	1
Number Conservation:	3
Seriation:	1

All WISC patterns were average and homogeneous. Bobby is operational on conservation of number but preoperational in all other areas. At his C.A. and with the IQ range over 100, he should be concrete operational. This was considered one clue in explaining the underachievement, and probably explains the relatively low score (8) in WISC Arithmetic.

The problem for the clinician is to determine why Bobby is preoperational and has almost no academic skills.

Language Data:

The PPVT IQ score is 115 (superior range) and there is only one error on the Wepman. There are problems in language, however, indicated by *ITPA* scores.

P.L.A.: 7-5

Automatic-Sequential Level

	<i>Auditory</i>	<i>Visual</i>
Memory	10-3	5-1
Closure:		7-2
Auditory	6-1	
Sound Blending	8-7+	
Grammatic	8-6	

Representational Level

	<i>Auditory</i>	<i>Visual</i>
Reception	6-10	7-4
Association	7-8	8-0
Expression	7-8	6-1

There is an overall deficit at the representational level, with the two lowest scores in Auditory Reception and Motor Expression. Auditory Sequential Memory and Sound Blending are normal, Grammatic Closure an area of moderate deficit, but Visual Sequential Memory, Visual Closure and Auditory Closure are severely retarded.

Spatial Data:

Purdue Perceptual-Motor Survey:

Balance and Posture	4 (top score possible)
Body Image	3 to 4
Perceptual-Motor Match	3
Ocular Control	4
Form Perception	4

He is completely right dominant.

Frostig DTVP:

Eye-Motor Coordination	8-6
Figure Ground	8-3(top score)
Form Constancy	6-9
Position in Space	7-0
Spatial Relations	8-3(top score)

Representational Space (stage):

Localization of Topographical Positions: 3A

Concept of Opposition of Left and Right: 1A

Draw-A-Man: 70

Bender Gestalt: 88

There is slight immaturity on the Purdue in Body Image and Perceptual-Motor Match. Although dominance has emerged (right dominant), he cannot handle elementary projective relations of before-behind when they have to be inverted, nor does he know left and right on his own body. There are two areas of deficit on the Frostig: Form Constancy at 6-9 and Position in Space at 7-0. The Draw-A-Man IQ is 70 and the Bender Gestalt score is 88, the former two S.D. below average and the latter, borderline.

Social Data:

Socially Bobby is well adjusted, activity level is average, and social skills are above average.

Academic Data (grade level):

Word Meaning	1.7 (7th month of grade 1)
Paragraph Meaning	1.6
Spelling	1.7
Arithmetic	1.8

Word attack skills are minimal and limited to sounding a simple consonant at the beginning of a word. Vowel rules are not understood. He appears to recognize words with a distinctive configuration, indicating words are perhaps being learned primarily through the visual channel. His approach to spelling is similar. Comprehension skills are practically nil.

In arithmetic, counting concepts are limited to more than, less than, and equal to. Understanding of place value involves placing ones and tens in appropriate parts of a place value box and counting, e.g., 4 bundles of 10 and 3 ones = 43; he cannot write numbers beyond 99. He has initiated the two most elementary laws of the natural number system but can not generalize the rule. Computational skills consist of addition and subtraction combinations, e.g. $6 + 2 = 8$; $7 - 3 = 4$.

Bobby was one of the most serious cases of academic underachievement encountered in the study. There appeared to be severe splintering of skills across language and visual-perceptual areas. Two patterns of deficit were interpreted from the data:

1. A verbal deficit in language functioning, encompassing all areas at the representational level, and either related to or causing retardation in progress towards development of operational thought. The pattern also included a closure deficit in both channels and a severe deficit in visual memory.

2. A perceptual-motor deficit which seemed to centre around a deficit in form and position, and coordination of the two sides of the body: Body image and perceptual motor match on the one hand, and inability to handle projective relations of left-right, before-behind on the other. Recognition of form also appeared to be deficit. The Bender Gestalt at 88 consisted of immature forms, rather than errors of separation, rotation or perseveration. Visual-Motor integration appeared to be intact but three areas of visual perception, namely, form, closure and position in space, were deficit.

Presented with this clinical picture and the almost complete lack of achievement in academic areas the remediation involved two stages administered concurrently:

1. Remediation of basic deficit areas in language, perception and perceptual-motor development.

2. Building an academic program around areas of strength while attempting to remediate areas of deficit:

(a) a visual approach to word attack skills — Rebus Reading Program, configuration, structural analysis, etc. — to build a basic sight vocabulary and improve attitude towards reading through successful experiences;

(b) a strong program in phonetic skills to be used both to remediate auditory closure and integrate closure with the strength in sound blending, and later as a supplementary tool in word analysis (auditory discrimination was intact);

(c) building a foundation of basic number concepts by using a concrete discovery approach which promoted development of conservation and operational thought as well as basic arithmetic content;

(d) remediation of areas of basic skills such as auditory-vocal and visual-motor association was integrated with academic content in reading comprehension.

In summary, an attempt has been made to lead the reader through the procedure followed in making the psychoeducational diagnosis through involvement in the interpretation process in sample case studies. The following chapter will deal with the end product of the psychoeducational diagnosis, the treatment program.

CHAPTER IV PSYCHOEDUCATIONAL PROGRAMMING

As a general rule, the WISC and observation data were used as the starting point for programming. To clarify the procedure, case studies will be presented from interpretation of diagnostic data through treatment programs. Posttest data are presented in parentheses. After each case study the prescription recommended for follow-up is presented. Finally, a general summary of programming principles will be presented.

CASE STUDIES

CASE STUDY I: BILLY, C.A.: 7 - 4

Billy was a very timid, hypoactive child from an upper middle class family. He was frequently absent from school because of illnesses such as asthma and stomach pains. There appeared to be no physical basis for the latter. He had been in an opportunity classroom for approximately one year and had made very little progress academically. His vocabulary was poor both in quantity and quality and was definitely at variance with his home background. His test data are presented below.

I. Intellectual Data:

Stanford Binet: Mental Age: 5-4 (6-0); IQ: 68 (73)

WISC Verbal IQ: 76 (79); Performance IQ: 93 (97)

<i>Verbal Subtests *</i>		<i>Performance Subtests *</i>	
Information	6 (6)	Picture Completion	8 (8)
Comprehension	6 (7)	Picture Arrangement	8 (12)
Arithmetic	8 (5)	Block Design	10 (9)
Similarities	8 (8)	Object Assembly	9 (8)
Vocabulary	5 (7)	Coding	10 (11)
Digit Span	4 (6)		

*scaled scores

Measures of "g": Similarities (8), Vocabulary (5), Block Design (10)

WISC Patterns:

(1) Conceptualization: Similarities (8) + Comprehension (6) + Vocabulary (5) =
8 + 6 + 5 = 19

(2) Spatial: Picture Completion (8) + Block Design (10) + Object Assembly (9) =
8 + 10 + 9 = 27

(3) Sequencing: Digit Span (4) + Coding (10) + Picture Arrangement (8) = 4 +
10 + 8 = 22

Distractibility Index: Arithmetic (8) + Digit Span (4)

Logico-Mathematical Concepts (stage):

Multiplication of Classes	3 (3)
Inclusion of Classes	1 (1)
Conservation of Number	1 (1)
Conservation of Length	3 (3)
Seriation	0-1 (1)
Measurement of Length	0 (1)

Analysis:

Billy appears to be a mildly retarded child (Binet IQ: 68; M.A.: 5-4; verbal IQ: 76). However, with a Similarities score of 8 and Block Design score of 10, both "good" measures of g, it is hypothesized there may be potential for normal functioning. The Vocabulary score of 5 is in the retarded range, with a very low vocabulary load and defining at the level of characteristic or use. Receptive vocabulary is also low (PPVT Mental Age: 5-2; IQ: 81).

Performance IQ and performance subtest scores are within normal limits: IQ at 93 and subtest range from 8 to 10. Verbal and Performance IQs are 17 points apart. The spatial pattern is normal and homogeneous (8 + 10 + 9). The conceptualization pattern is low and discrepant: Comprehension (6) + Vocabulary (5) + Similarities (8). Digit Span at 4 is very low but seems not related to a sequencing and/or memory problem per se (4 + 8 + 10). There is no indication of distractibility, (Arithmetic (8) + Digit Span (4)), and indeed, he is hypoactive.

He is concrete operational in two areas (conservation of length and multiplication of classes) but preoperational in all other areas assessed. He is barely able to function on the seriation task.

A tentative hypothesis of language disability is interpreted from the data: low verbal IQ scores (68, 76), retarded conceptualization ability, poor quantity and quality of vocabulary at both receptive and defining levels, and mainly preoperational level thought. Spatial-motor skills appear to be intact.

II. Language Data:

PPVT Mental Age: 5-2 (7-1); IQ: 81 (92)

Wepman Auditory Discrimination Test: 4 X errors; zero Y errors

ITPA: P.L.A.: 4-11 (5-9)

Automatic-Sequential Level

	<i>Auditory</i>	<i>Visual</i>
Memory	3-5 (3-5)	4-10 (6-2)
Closure:		8-0 (8-9)
Auditory	3-1 (4-11)	
Sound blending	5-6 (6-8)	
Grammatic	2-2 (5-2)	

Representational Level

	<i>Auditory</i>	<i>Visual</i>
Reception	4-10 (4-1)	4-10 (8-10)
Association	5-1 (5-5)	5-6 (5-3)
Expression	5-2 (5-4)	4-10 (6-9)

Analysis:

There appears to be an overall language deficit, particularly severe at the automatic-sequential level: three of the six test scores are within the two to three year range. Only one test score (Visual Closure) is within normal limits. There does not appear to be a discrimination deficit. Hearing was assessed and is normal.

*III. Perceptual-Motor Data:**Purdue Perceptual-Motor survey:*

All subtest scores are 3 on a scale from 1 to 4, slightly immature for his C.A. of 7-4. At posttest, one score (Form Perception) had increased to 4.

Harris test of Lateral Dominance:

Hand dominance	Right (R)
Eye dominance	Mixed (M)
Foot dominance	Mixed (M)

Representational Space Tests (stage):

Localization of Topographical Positions	3A (3A)
Concepts of Left and Right	1A (1B)

Frostig, DTVP:

Eye-Motor Coordination	7-0 (8-6)
Figure Ground	6-0 (8-3: upper limit)
Form Constancy	7-6 (9-0: upper limit)
Position in Space	7-0 (6-3)
Spatial Relations	6-6 (7-6)

Draw -A - Man IQ: 75 (86)

Bender Gestalt Test: 102 (90)

Analysis:

Motor development is slightly immature for his C.A., as is the understanding of the concept of opposition of left and right. Hand dominance is right but eye and foot dominance are mixed. Localization of Topographical Positions is normal for his C.A. Visual perception is slightly immature, as is the drawing of the human figure. Visual-motor integration appears normal.

IV. Social Data.

Coordination of perspectives, a test of egocentricity: stage 2A

California Test of Personality:

(a) Personal adjustment: All areas are within normal limits except Withdrawing Tendencies and Nervous Symptoms.

(b) Social adjustment: All areas are within normal limits except Anti-Social Tendencies and Community Relations.

Activity Level: 4.00 or hypoactive (3.50)

Vineland Social Maturity Scale: Social Age: 6-3 (7-0); Social Quotient: 85 (88)

Analysis:

A hypoactive, timid, withdrawn child, Billy exhibited withdrawing tendencies, nervous symptoms and anti-social tendencies on the California test (and within the school setting). His activity level is below average and his social skills are immature for his C.A. The stage of development on a test of egocentricity is normal for his chronological age.

V. Academic Data:

Metropolitan Test of Reading Readiness:

Word Meaning	C
Listening	B
Matching	B
Alphabet	B
Number	A
Copying	A
Total Readiness	B

Arithmetic Diagnostic Test:

Counting: rote counting only

Place Value: practical understanding of ones and tens

Properties: nil

Computational Skills: nil

Analysis:

Except for word meaning, Billy is ready for a formal reading program, and a number program. His understanding of arithmetic is at the beginning grade one level.

Diagnosis:

Billy appears to be a child with potential for normal functioning but scores on verbal tests are depressed. It is hypothesized that the basic disability is a language deficit.

The language disability appears to be overall but particularly severe at the automatic-sequential level and for vocabulary, including receptive vocabulary. He is preoperational in logico-mathematical concepts. Language abilities range from the

second to the fifth year level. Auditory discrimination appears to be intact. Motor ability, while somewhat immature, is not splintered. Lateral dominance is not completely established; understanding of left and right, drawing of the human figure and visual perception are somewhat immature. Ability to copy projective relations, left-right and before-behind, and visual motor integration are normal for his chronological age level. The immaturity in perceptual-motor areas is due possibly to lack of exposure to necessary experiences.

Socially, Billy is timid, withdrawing and hypoactive, with immature social skills. Academically, he is ready for formal academic work but the initiation has not been successful, even though he has been exposed to instruction for more than one year. The problems in all areas are aggravated because he is so frequently absent from school.

Psychoeducational Program:

The major thrust of the program was to improve language functioning, to build vocabulary and to improve socialization skills. Consequently, every aspect of the program stressed these objectives. Labels were emphasized and words were defined in practical context. He was taught how to ask and how to answer questions. Games such as tactile recognition, twenty questions and language lotto were worked into play periods.

A formal language program aimed at improved use of meaningful language was administered. While no attempt was made to teach test-like items at the representational level, reception and expression in both channels received particular attention in most language lessons. For example, a small group of children would alternate in verbalizing and pantomiming short stories. The program used most extensively was the Peabody Language Program, (1965-67).

The Thurstone Learning to Think Series (Thurstone, 1972) was used to improve thinking skills. An attempt was made to increase operational level thought by using the Fletcher Mathematics Program (Fletcher, 1970). This program attempts to promote conservation by presenting number concepts in concrete, discovery type situations.

Exercises to build auditory and visual short term memory were used for five minutes a day, every day. Tactile and kinesthetic stimuli were used to reinforce auditory and visual stimuli. A phonics program, Sound Order Sense (Semel, 1970), was administered to improve and integrate auditory closure and sound blending. Games and exercises were developed to teach grammatic forms such as plurals, tenses, comparisons, etc.

Two developmental motor programs, Cratty, (Cratty, 1967), and the Frostig Move, Grow and Learn, (Frostig, 1969) were used. Time was spent building concepts of left and right. Emphasis was placed on participating in group playground and physical education experiences. No formal program in visual perception was followed, except to draw attention to details and manipulation of materials during art periods and school projects, e.g. Hallowe'en projects.

Academic programs were introduced using materials not formerly used for instruction. Because of the need to build and generalize conservation, the Fletcher Mathematics program, (Fletcher, 1970) supplemented by Invicta Teaching Aids and teacher-made materials to make discovery of concepts possible through

concrete experiences were used. Because visual perception, visual-motor integration and spatial abilities in general were areas of strength, visual word attack skills were stressed in initial reading experiences. These were later supplemented by phonic skills as they developed. A basal reading program was followed.

Except for sessions aimed at improving grammar and syntax, and memory, all instruction and working sessions were carried out in small groups. Play periods involved many more children in group situations. This format was considered essential because of the need for socialization.

Follow-Up:

While results were not startling Billy made reasonable progress, and for the first time in his school career. The Stanford Binet Mental Age and IQ increased from 5-4 and 68 to 6-0 and 73. The WISC verbal IQ increased from 76 to 79, and the performance IQ from 93 to 97. The scaled scores increased as follows: Comprehension from 6 to 7; Vocabulary from 5 to 7; Digit Span from 4 to 6; Picture Arrangement from 8 to 12 and Coding from 10 to 11. The conceptualization pattern increased from 19 to 22 and the sequencing pattern from 22 to 29.

Two areas of logico-mathematical concepts improved: measurement of length, from inability to perform to stage 1, and seriation from stage 0-1 to stage 1. The PPVT Mental Age increased from 5-2 to 7-1 and the IQ from 81 to 92. The P.L.A. score on the ITPA increased from 4-11 to 5-9, 10 months gain in a seven month period. Grammatic Closure increased from 2-2 to 5-2, Auditory Closure from 3-1 to 4-11, Sound Blending from 5-6 to 6-8, Visual Closure from 8-0 to 8-9. Visual Sequential Memory increased 16 months, from 4-10 to 6-2 but Auditory Sequential Memory remained unchanged at 3-5. All representational level tests increased except Visual-Motor Association and Auditory Reception. Visual Reception increased from 4-10 to 8-10, Vocal Expression from 5-2 to 5-4 and Motor Expression from 4-10 to 6-9.

Form Perception on the Purdue improved from 3 to 4 and left-right concepts from stage 1A to 1B, but dominance remained unchanged. The Frostig scores approached upper limits; the Draw-A-Man IQ score increased from 75 to 86.

Socially, Billy made substantial progress. This was evident from subjective comments made by teachers but also from the California Test of Personality scores: Sense of Personal Worth increased from P_{30} to P_{90} , Withdrawing Tendencies from P_{10} to P_{40} and Nervous Symptoms from P_{10} to P_{30} . In Social Adjustment, Social skills increased from P_{50} to P_{90} , Anti-social Tendencies from P_{10} to P_{50} , Family Relations from P_{30} to P_{90} . Activity level approached the normal level of 3.0, while Social Age increased 9 months to 7-0. Arithmetic and Reading were at grade 1 level.

In summary, Billy showed improved performance, not only in language, the major area of deficit, but in other areas as well including transfer in the form of higher scores on the descriptive tests. The administrative format followed was utilization of resource teacher.

CASE STUDY II: JOAN, C.A.: 6-6

Joan is typical of a group of seven children who appeared to be mildly retarded for cultural familial reasons. They were a fairly homogeneous group and were grouped together for much of the program.

Joan was hyperactive and very immature - she could not dress or toilet herself, had to be taken to other parts of the building and manifested many "babyish" behaviours. The test data for both pre and posttest are presented together, the latter in parentheses.

I. Intellectual Data:

Stanford Binet: Mental Age: 4-6 (5-3); IQ: 66 (72)

WISC Verbal IQ: 65 (65); Performance IQ: 65 (78)

<i>Verbal Subtests</i>		<i>Performance Subtests</i>	
Information	4 (4)	Picture Completion	5 (9)
Comprehension	5 (4)	Picture Arrangement	6 (8)
Arithmetic	4 (4)	Block Design	4 (5)
Similarities	5 (5)	Object Assembly	6 (7)
Vocabulary	4 (5)	Coding	4 (5)
Digit Span	2 (4)		

Measures of "g": 5, 4, 4 (5, 5, 5)

WISC Patterns:

Conceptualization pattern:	5 + 5 + 4 (4 + 5 + 4)
Spatial pattern:	5 + 4 + 6 (9 + 5 + 7)
Sequencing pattern:	2 + 4 + 6 (4 + 5 + 8)
Distractibility Index:	4 + 2

Logico-Mathematical Concepts (stage):

Multiplication of Classes	1-2 (1-2)
Inclusion of Classes	0 (1)
Conservation of Number	0 (0)
Conservation of Length	2 (3)
Seriation	0 (0)

Analysis

Verbal and Performance IQ at 65 were identical and within the E.M.R. range. The range of functioning on subtests is very narrow and homogeneous. Patterns are very similar. The preoperational stage of thinking is just being initiated. Working hypothesis: Joan is a mildly retarded child and is functioning like a preschooler. She is immature, babyish, and unable to cope with the readiness program usually presented to children beginning grade one, even though she has been in a school program for one year. Functioning appears fairly homogeneous without any particular strengths and weaknesses.

II. Language Data:

PPVT Mental Age: 5-11 (5-11); IQ: 89 (81)

Wepman Test of Auditory Discrimination: Invalid at both pre and posttest because the concepts of same and different were not understood.

ITPA: P.L.A.: 4-4 (5-5)

Automatic-Sequential Level

	<i>Auditory</i>	<i>Visual</i>
Memory	2-5 (4-2)	5-7 (4-7)
Closure :		6-9 (5-8)
Auditory	5-3 (5-1)	
Sound Blending	5-10 (8-7+)	
Grammatic	4-10 (5-2)	

Representational Level

	<i>Auditory</i>	<i>Visual</i>
Reception	4-3 (8-4)	5-7 (4-7)
Association	3-9 (5-1)	3-10 (4-8)
Expression	4-8 (5-6)	3-10 (5-0)

Analysis

Receptive vocabulary is a relative strength. Auditory discrimination may be functioning but concepts of same and different are not known, however, Auditory Closure and Sound Blending are only one year retarded for C.A. so it is possible the ability to discriminate sounds is not too badly retarded. Except for memory, severely deficit in both channels, language at the automatic-sequential level is relatively higher than language at the representational level. Visual Reception is an area of moderate deficit but all other processes of language at the representational level are severely retarded. There appears to be somewhat more difficulty in the visual channel than the auditory channel at the representational level.

III. Perceptual-Motor Data:

Purdue Perceptual-Motor Survey:

Balance and Posture	3 (4)
Body Image	2-3 (3)
Perceptual-Motor Match	3 (3)
Ocular Control	2 (3)
Form Perception	2-3 (2-3)

Harris Test of Lateral Dominance:

Hand Dominance	Right (Right)
Eye Dominance Near:	Right (Right)
Far:	Mixed (Right)
Foot Dominance	Mixed (Right)

Representational Space Tests (stage):

Localization of Topographical Positions	1 (1)
Concepts of Left and Right 1A	(1A)

Frostig, DTVP:

Eye-Motor Coordination	5-0 (4-6)
Figure Ground	3-3 (3-6)
Form Constancy	4-6 (6-9)
Position in Space	4-3 (5-0)
Spatial Relations	4-0 (5-0)

Draw-A-Man I.Q.: 68 (62)

Bender Gestalt Test: 83 (78)

Analysis:

Motor development is very retarded and dominance for eye and foot are mixed. In fact, every area of spatial-motor development is extremely retarded.

IV. Social Data:

Coordination of Perspectives: unable to function on this test at pre or posttest.

California Test of Personality: Invalid at both pre and posttest

Activity Level: 2.0 - very hyperactive (2.0)

Vineland Social Maturity Scale: Social Age: 3.2 (4.5); Social Quotient: 49 (62)

Analysis:

Very immature, few social skills, unable to dress or toilet herself, very hyperactive, attention seeking. She is definitely below standards expected of grade 1 children.

V. Academic Data:

Metropolitan Readiness Test:

Word Meaning	C (B)
Listening	D (C)
Matching	D (C)
Alphabet	B (B)
Number	D (C)
Copying	E (D)
Total Readiness	D (C)

Analysis:

No academic skills, not ready for formal academic instruction.

Diagnosis:

Joan is a mildly retarded child functioning far below levels expected for grade 1 children. No particular areas of strength or deficit are apparent but she is lacking in most skills required to perform in a learning situation. She is hyperactive in volume of speech sounds, interference with others and attention seeking. Priority: to build the foundation skills necessary for learning, if she is to profit from an educational program.

Psychoeducational Program:

1. To teach basic concepts of same, different, up, down, top, bottom, front, back etc; discrimination of size, color, distance, shapes; discrimination of gross sounds, e.g. walking from running, airplanes from cars, rain from wind. etc.; discrimination of odors. To teach order: first, middle, last; top, middle, bottom; to teach discrimination of visual differences — orientation, detail, etc. She and the other children at this level were unable to function on even the most basic commercial programs and exercises had to be developed. Montessori materials and exercises proved valuable.
2. To bring activity level to a point where she could sit still long enough to attend and to teach her to play and work with other children, a behaviour modification program was implemented.
3. Developmental programs in motor ability were administered: the Cratty program (Cratty, 1967) supplemented by the Frostig, Move, Grow and Learn program (Frostig, 1969). Joan was one of the children whose program in motor development was supplemented by gymnastics' training.
4. Cutting, pasting, manipulation of materials in art work were used for visual-motor integration.

5. No formal program was followed in visual perception but approximately half way through the study, she was able to begin working in the beginning book of the Thurstone Learning to Think series (Thurstone, 1972). Ability to attend to detail and discrimination were stressed in this program.
6. In language, the Peabody Rebus program (1969) was used to develop vocabulary, and supplemented by the Peabody Language Program (1965-67). The Sound Order Sense (Semel, 1970) program was used to develop auditory discrimination. Exercises developed by Merle Karnes (Karnes, 1968) for a Head Start program were used for development of memory, reception and expression. Much time was spent telling stories from pictures.
7. A great deal of emphasis was placed on developing social skills and the sequence suggested by the Vineland Social Maturity Scale (Doll, 1949) was followed.
8. No attempt was made to teach formal academic skills, except prenumber experiences from the Fletcher Mathematics program (Fletcher, 1970).

Follow-Up:

The Stanford Binet IQ increased by six points to 72 and the WISC performance IQ by 13 points to 78. The largest increases occurred in Picture Completion and Picture Arrangement but each of the WISC performance subtests increased by at least one scaled score. The conceptualization pattern remained the same but the spatial and sequencing patterns increased, and there was slight progress towards conservation.

In language, there were substantial changes on the ITPA but no change on the Wepman and PPVT. Purdue Perceptual-Motor scores improved and Joan became completely right dominant, although she still did not know right and left on her own body. Visual perception improved and activity level approached normal level. Social skills increased by one year three months. In all areas except copying, she moved closer to the readiness level required for formal instructions in academic subjects.

The posttest scores were used to suggest a follow-up program to the teacher for the following year:

1. Joan is still functioning in the mildly retarded range and is preoperational. An intensive program to develop logical thinking and conceptualization skills, particularly in the verbal areas, was recommended.
2. An intensive language program, emphasizing verbal abstracting skills and all aspects of vocabulary development should be followed. A sequencing deficit for short term, non-meaningful material is evident and should be

systematically remediated. The posttest scores point to a deficit in visual language skills at the representational level. Emphasis should be placed on developing language processes at the representational level.

3. Balance and posture are now normal for her C.A. level, but continued development is required in other areas of perceptual-motor development and in developing the concept of opposition of left and right. A program is also required for visual-motor integration and visual perception. Tangramath exercises and the Fitzhugh Spatial Organization series (1969), Books 101, 102 and 104 are recommended.
4. Continuation of the behavior modification program is recommended with continued emphasis on social skills and study habits.
5. Joan is now ready for a formal academic program, although areas at level C require a continuing readiness program to be administered concurrently with the academic program. The Rebus Reading program (1969), supplemented by a strong phonics program is recommended for reading, while the Fletcher Mathematics program (Fletcher, 1970) should continue for arithmetic development and development of operational thought.

CASE STUDY III: DAVID, C.A.: 7-7

David was enrolled in the school by his caseworker in order to participate in the study. Emotionally he was very disturbed and he had a history of being abused and deprived from the time of his birth. He was not toilet trained and would not go near a washroom unless accompanied by an adult. Toileting was frequently accompanied by hysterics. He was the most aggressive and hyperactive child in the study and could not relate to any female teacher or to the other children. As a first step, he was transferred to the opportunity class taught by a male teacher. Pre and posttest results are presented.

I. Intellectual Data:

Stanford Binet: Mental Age: 5-10 (7-0); IQ: 74 (84)

WISC Verbal IQ: 66 (80); Performance IQ: 99 (94)

<i>Verbal Subtests</i>		<i>Performance Subtests</i>	
Information	5 (5)	Picture Completion	12 (9)
Comprehension	6 (8)	Picture Arrangement	6 (8)
Arithmetic	4 (7)	Block Design	12 (11)
Similarities	4 (6)	Object Assembly	13 (11)
Vocabulary	4 (9)	Coding	6 (7)
Digit Span	4 (6)		

WISC Patterns:

Measures of "g": 4, 4, 12 (6, 9, 11)

Conceptualization pattern: $6 + 4 + 4$ ($8 + 6 + 9$)

Spatial pattern: $12 + 12 + 13$ ($9 + 11 + 11$)

Sequencing pattern: $4 + 6 + 6$ ($6 + 7 + 8$)

Distractibility Index: $4 + 4$ ($7 + 6$)

Logico-Mathematical Concepts (stage):

Multiplication of Classes	2 (2)
Inclusion of Classes	1 (1)
Conservation of Number	1 (1)
Seriation	0 (2)

Analysis:

WISC verbal and performance IQs are separated by 33 points, with performance IQ at 99. The Stanford Binet IQ of 74 is consistent with the WISC verbal IQ of 66. The verbal scores range from 4 to 6, all within the retarded range. The conceptualization pattern is uniformly low. The spatial pattern is also uniform but in the high average range. Sequencing at $4 + 6 + 6$ points to an overall deficit in memory and/or sequencing. He is preoperational and unable to perform on one of the Piagetian tasks, seriation.

Tentative hypothesis: a severe deficit in the ability to understand and process verbal material and a memory and/or sequencing deficit, possibly the result of severe deprivation. Spatial ability and nonverbal processing abilities appear to be intact.

II. Language Data:

PPVT Mental Age: 7-1 (6-3); IQ: 92 (85)

Wepman Auditory Discrimination Test: 4 X errors, zero Y errors, remained unchanged at posttest

ITPA: P.L.A.: 5-4 (5-9)

Automatic-Sequential Level

	<i>Auditory</i>	<i>Visual</i>
Memory	4-2 (5-0)	6-2 (9-9)
Closure:		6-4 (5-5)
Auditory	5-6 (5-9)	
Sound Blending	6-5 (7-10)	
Grammatic	5-2 (5-2)	

Representational Level

	<i>Auditory</i>	<i>Visual</i>
Reception	3-8 (5-6)	6-5 (7-1)
Association	5-5 (6-2)	5-6 (5-6)
Expression	4-3 (5-4)	5-10 (6-5)

Analysis:

Except for Sound Blending and Visual Sequential Memory, the scores on the ITPA are below levels expected at David's C.A. level. Several areas are also below the M.A. level of 5-10. Auditory Sequential Memory and Auditory Reception and Vocal Expression are the most severe areas of deficit. While most areas of functioning are low, the deficit is particularly severe in the auditory channel. Auditory discrimination appears normal.

*III. Perceptual-Motor Data:**Purdue Perceptual-Motor Survey:*

Balance and Posture	3 (4)
Body Image	2-3 (3)
Perceptual-Motor Match	3 (3)
Ocular Control	2 (3)
Form Perception	3 (3)

Harris Test of Lateral Dominance:

Hand and Foot Dominance	Right
Eye Dominance: Near	Right
Far	Mixed (No change)

Representational Space (stage):

Localization of Topographical Positions: 2B (2B)

Concepts of Left and Right: 1B (1B)

Frostig DTVP:

Eye-Motor Coordination	5-3 (10+: upper limits)
Figure Ground	6-0 (5-3)
Form Constancy	5-6 (6-3)
Position in Space	7-0 (8-9: upper limits)
Spatial Relations	8-3 (8-3: upper limits)

Draw-A-Man: 75 (71)

Bender Gestalt Test: 63 (86)

Analysis:

Motor development is immature. The Ocular Control subtest performance is marked by jerky eye-movements, facial grimacing and blinking. It is difficult to determine whether the behavior is due to social inadequacies or a problem in ocular control, since the grimacing and blinking occur whenever he is approached by an adult. He is almost completely right dominant and representational space is normal for his chronological age. Except for Spatial Relations, visual perception is low as are the Draw-A-Man and Bender Gestalt Test scores. He is unable to perform on the Coordination of Perspectives test. In summary, understanding of cognitive space is normal for the C.A. 7-7, but perceptual-motor development and visual perception are immature.

IV. Social Data:

Coordination of Perspectives, a test of egocentricity: stage O (2A)

California Test of Personality:

Two areas of personal adjustment are below the average range: Withdrawing Tendencies and Nervous Symptoms. All areas of social adjustment are low normal or below the average range, the lowest being Antisocial Tendencies. On the posttest the greatest gains were shown for Withdrawing Tendencies (P_{10} to P_{80}), and Social Skills (P_{30} to P_{70}).

Activity Level: He is extremely hyperactive (1.00) in all areas assessed.

Vineland Social Maturity Scale: Social Age: 3.6 (8.5); Social Quotient: 46 (103)

Analysis:

Social development is the area of most serious disability and remediation in this area is to be given top priority.

*V. Academic Data:**Metropolitan Readiness Test:*

Word Meaning	C (C)
Listening	C (C)
Matching	C (B)
Alphabet	B (A)
Number	D (C)
Copying	C (B)
Total Readiness	C (B)

Analysis:

Reading readiness is at the "C" level or average prognosis for reading, while number concepts are at the pre-readiness level. Academic skills are nil.

Diagnosis:

1. David is an explosive, aggressive child who cannot work or play with other children, cannot relate to adults and is extremely disturbed. Unless his behavior can be controlled, he cannot be contained in the opportunity classroom. His behavior is dangerous to himself and the other children, not to mention the teachers who frequently get kicked, slapped, etc. The first priority is to bring behavior within a more acceptable range. As a first step he is to be transferred to the homeroom of the male teacher.
2. There appears to be a deficit for all verbally presented materials, possibly due to his very deprived background. Nonverbal intelligence is within normal limits.
3. There is a language deficit, particularly severe in the auditory channel and for Auditory Sequential Memory, Auditory Reception and Vocal Expression. However, receptive vocabulary and auditory discrimination are intact.
4. While space seems to be understood at a cognitive level, there is immature perceptual-motor and visual perceptual development, possibly due to lack of experience.
5. He is close to a readiness level for reading (but not for number), however, it is not possible to carry out academic instruction until his behavior is controlled.

Psychoeducational Program:

1. To modify behavior several stages of programming were followed:
 - a. He was moved to a homeroom taught by a male teacher.
 - b. A behavior modification program was implemented.
 - c. Limits were set concerning the most destructive behaviors which would not be tolerated, and the limits were rigidly adhered to. The program was two-fold: elimination of negative behaviors and establishment of positive behaviors, beginning with social skills and ability to maintain relationships with adults.
 - d. Highly structured instructional programs were implemented.

- e. Quite coincidentally he was moved to a foster home which proved to be an excellent placement. Management at home and school became consistent. The case worker was very able and interested in the child and met with the project directors several times. There is no doubt the foster home placement played an important part in his progress.
2. Development of verbal skills was also an area of priority. The Thurstone Learning to Think Program (Thurstone, 1972) was administered. The Rebus Reading Program (1969) which uses a visual approach to reading and stresses vocabulary development was also administered. Short term memory in both channels was remediated by using exercises from Bush and Giles (1969) and supplementing auditory and visual stimulation with tactile and kinesthetic stimulation.
3. Although motor development and visual perception were below levels expected at C.A. 7-7, it was hypothesized the problem was immaturity due to lack of experience rather than pathology. A developmental program (Cratty, 1967) was followed and supplemented with a gymnastics program for motor development. Tangramath and the Fitzhugh Spatial Organization program, Number 104 (1969) were used to teach form discrimination in two and three dimensions. The Thurstone program (1972) also helped develop ability to note and discriminate details, factors in visual perception.
4. The academic programs administered included the Rebus Reading program (1969), aimed at building a basic sight vocabulary through an area of relative strength, the visual channel. The Talking Alphabet program (1967) was used to develop basic phonic skills and eventually he was moved to a phonetic reading series, the Lippincott series (1970). With the development of phonetic skills and the start in reading provided by the Rebus program, the transition was very smooth and reading became an area of strength. The following year integration was begun in a regular grade two classroom, in the reading program.
5. The Distar Arithmetic program (Engelmann and Carnine, 1967) was used for two reasons — because of the structure it provided, and because the hyperactive behavior made it impossible to use any approach to arithmetic which involved manipulation of materials, etc. While he acquired very little understanding of basic number concepts in this program, he did progress to the point where an arithmetic program stressing understanding could be initiated, towards the end of the study.

Follow-Up:

The posttest scores showed a substantial gain in most areas: verbal IQ, 66 to 80; conceptualization pattern, from 6 + 4 + 4 to 8 + 6 + 9; sequencing pattern from 4 + 6 + 6 to 6 + 7 + 8. Only one area of logico-mathematical

concepts improved, seriation, from inability to perform on the task to stage 2. Language scores on the ITPA increased in most areas, particularly in memory and at the representational level. Motor development improved and the facial grimacing and blinking disappeared.

Figure Ground and Form Constancy improved least and probably were manifestations of a moderate learning disability. Most noticeable of all, the change in behavior was outstanding. Photos taken as the study progressed showed the changes very clearly. From being a child who was noted for his scowl and angry outbursts, he became a smiling, happy little boy who could play with other children and carry on spontaneous conversation with adults. He moved back to his former classroom for instruction in some areas and the year following the study he was gradually integrated in a regular classroom in areas where his skills had developed. Within two years he was functioning in a regular classroom in all academic areas at levels expected for his chronological age level.

CASE STUDY IV: MARY, C.A.: 9-2

Mary is a very quiet child from a home where English was the second language. She appeared to be a slow learner. Her test profile with both pre and posttest scores is presented below.

I. Intellectual Data:

Stanford Binet: Mental Age: 7-2 (8-2); IQ: 76 (82)

WISC Verbal IQ: 80 (80); Performance IQ: 94 (96)

<i>Verbal Subtests</i>		<i>Performance Subtests</i>	
Information	4 (4)	Picture Completion	11 (10)
Comprehension	7 (6)	Picture Arrangement	11 (9)
Arithmetic	7 (6)	Block Design	9 (9)
Similarities	9 (11)	Object Assembly	9 (7)
Vocabulary	7 (6)	Coding	6 (12)
Digit Span	7 (8)		

Measures of "g": 9, 7, 9 (11, 6, 9)

WISC Patterns:

Conceptualization pattern: 7 + 9 + 7 (6 + 11 + 6)

Spatial pattern: 11 + 9 + 9 (10 + 9 + 7)

Sequencing pattern: 7 + 6 + 11 (8 + 12 + 9)

Distractibility Index: 7 + 7

Logico-Mathematical Concepts (stage):

Multiplication of Classes	2 (3)
Inclusion of Classes	1 (3)
Conservation of Length	3 (3)
Conservation of Number	3 (3)
Measurement of Length	1 (2)
Seriation	2 (2)

Analysis:

Mary functions intellectually like a slow learner. The verbal IQ scores are within the slow learner range, performance IQ is slightly higher, but two of the better measures of g, Similarities and Block Design, are within normal range. Vocabulary at 7 is borderline but lack of familiarity with English as well as her habit of responding with one word answers, could be lowering the score. Operational thought has been initiated but not generalized to any extent. The spatial pattern is normal and homogeneous but the sequencing pattern points to a possible disability in short term non-meaningful memory and/or sequencing.

II. Language Data:

PPVT Mental Age: 6-1 (7-1); IQ: 75 (77)

Wepman Auditory Discrimination Test: 2 X errors

ITPA: P.L.A.: 6-10 (8-4)

Automatic-Sequential Level

	<i>Auditory</i>	<i>Visual</i>
Memory	6-3 (7-7)	6-2 (9-9)
Closure:		8-0 (9-0)
Auditory	6-9 (7-11)	
Sound Blending	8-7 (8-7+)	
Grammatic	6-2 (7-7)	

Representational Level

	<i>Auditory</i>	<i>Visual</i>
Reception	3-6 (8-7)	9-3 (10-10+)
Association	7-0 (6-9)	10-3+ (8-5)
Expression	5-10 (5-8)	10-4 (10-4+)

Analysis

In addition to the low vocabulary score on WISC Vocabulary, receptive vocabulary at 6-1 is also low. On the ITPA there appears to be a deficit in both channels. Auditory Reception and Vocal Expression are the most serious areas of deficit. Visual processes at the representational level are an area of strength.

III. *Perceptual-Motor Data:*

Purdue Perceptual Motor Survey:

Balance and Posture	3-4 (4)
Body Image	3 (4)
Perceptual-Motor Match	3-4 (4)
Ocular Control	4 (4)
Form Perception	4 (4)

Harris Test of Lateral Dominance:

Hand and Foot Dominance: Right
 Eye Dominance: Mixed

Representational Space (stage):

Localization of Topographical Positions: 3B (3B)

Concepts of Left and Right: 2 (2)

Frostig DTVP:

Eye-Motor Coordination	10+ (10+)
Figure Ground	8-3 (8-3)
Form Constancy	7-0 (9-0)
Position in Space	8-9 (8-9)
Spatial Relations	7-6 (8-3)

Draw-A-Man IQ: 66 (93)

Bender Gestalt Test: 106 (100)

Analysis:

Motor and perceptual-motor development are immature and dominance is not completely established. Representational space is normal for her C.A. as is visual perception, except for some immaturity in Form Constancy and Spatial Relations. The area of spatial development is an area of almost normal functioning and is therefore a strength.

IV. Social Data:

Coordination of Perspectives: stage 1B (1B)

California Test of Personality:

Four areas of personal adjustment are very low: Sense of Personal Worth and Personal Freedom, Feeling of Belonging and Withdrawing Tendencies. Except for Sense of Personal Worth, all scores were within the normal range at posttest. Three areas of social adjustment were also very low: Anti-Social Tendencies, Family and School Relations, and except for Family Relations they were still low at posttest.

Activity Level: Normal

Vineland Social Maturity Scale: Social Age: 11.0; Social Quotient: 120

Analysis:

Mary is a timid, withdrawn child and seldom interacts with other children. Social skills are well developed.

V. Academic Data:

Word attack skill	2.6 (2.9)
Paragraph meaning	1.9 (4.0+)
Spelling	2.3 (2.6)
Arithmetic	1.6 (2.2)

Arithmetic diagnosis:

Counting concepts are at beginning grade 1 (at posttest she was at the grade two level in understanding - counting concepts). Place Value understanding is limited to practical knowledge of ones and tens and writing of numbers to 99.

Understanding of properties of the natural number system was nil at the beginning of the study but she understood the two most elementary properties at posttest.

Computational skills: understanding was limited to simple addition and subtraction facts at pretest but she was able to add, subtract, multiply, divide at the grade three level at posttest.

Analysis:

The most serious academic deficit is in arithmetic, where there is no understanding of the basic concepts of number. She is generally preoperational in logico-mathematical concepts and it is hypothesized the preoperational thought and poorly developed verbal skills are the cause of underachievement. Reading skills and spelling are somewhat better developed.

Diagnosis:

Mary is functioning like a slow learner on both verbal IQ tests and language tests. There appears to be general low functioning in the auditory channel and there is a deficit in memory and/or sequencing in both channels. Auditory Reception and Auditory-Vocal Association are most seriously affected. Operational level thought has been initiated but not generalized. Spatial-motor development is generally well developed and an area of strength.

Hypothesis: A deficit in understanding for verbally presented materials, aggravated by timidity and a tendency to withdraw.

Psychoeducational Program:

1. Socialization skills are very immature and in need of development. The entire program was built around this need. Instruction was carried out in small group situations, with each group including several different children.
2. Verbal areas, as well as the need for verbalization, were stressed. Language was remediated by administering the Peabody Language program (1965-1967), supplemented by a strong phonics program. The generalization of operational thought was encouraged by using the Fletcher Mathematics program (Fletcher, 1970). Exercises from Bush and Giles (1969) were used to remediate sequencing and memory.
3. The Chaney-Kephart program (1969), was administered to remediate splintered motor skills. No specific program was followed for perception, except to emphasize form and shape by showing relationships among various shapes in Tangramath exercises. Color cues and verbal descriptions were used to draw attention to similar letters. A problem solving approach was given in differentiating shapes by teaching her to compare length of side, size of angles, and to change orientation in manipulating three-dimensional shapes.
4. The Fletcher Mathematics Program (1970) was followed. A basal reader series was used with more and more reliance being placed on phonetic word attack skills. The Reader Digest Skill Builder series was used to remediate comprehension skills. Training was given in transferring newly acquired phonic skills to spelling as well as for word attack.

Follow-up:

The gains in most academic areas were substantial. Operational thought was greatly generalized. In arithmetic, counting concepts and computational skills were increased to a level approaching C.A. expectations. At posttest place value still required intensive work as did properties of the natural number system.

On the standardized arithmetic test, the arithmetic score increased by six months to grade 2.2. Spelling increased three months to 2.6; word attack skills increased three months to 2.9, while reading comprehension increased more than two years.

IQ scores changed very little but the sequencing pattern increased to the normal range. Language scores did increase, the P.L.A. by one year six months. Visual language scores moved to upper limits. Auditory processes showed gains but Auditory-Vocal Association and Vocal Expression remained very serious areas of deficit.

All spatial-motor and visual perception scores reached upper limits. Socially she made progress but still did not initiate peer contacts to the extent desired.

Mary is typical of very timid children in our school system who function in a pseudo-retarded manner. When given encouragement, she blossomed and interaction with both peers and adults improved. At posttest, language, particularly Auditory Reception, Vocal Expression and Vocabulary, remained deficit areas. All areas of perceptual-motor development were normal. She was integrated into a regular grade IV classroom where she received additional assistance in deficit areas, but she functioned well and continued to develop socially and hold her own academically.

CASE STUDY V: JOSEPH, C.A.: 14-3

Joseph was the oldest child in the study and he and three other children in the same age range were grouped for most work, particularly academic subjects. He is an underachiever in terms of both chronological and mental age, generally disruptive and frequently absent from school. Pre and posttest scores are presented together, the latter in parentheses.

I. Intellectual Data:

Stanford Binet: Mental Age: 11-2 (12-0); IQ: 83 (87)

WISC Verbal IQ: 77 (76); Performance IQ: 96 (99)

<i>Verbal Subtests</i>		<i>Performance Subtests</i>	
Information	4 (5)	Picture Completion	10 (8)
Comprehension	8 (6)	Picture Arrangement	8 (8)
Arithmetic	5 (3)	Block Design	9 (9)
Similarities	9 (9)	Object Assembly	9 (14)
Vocabulary	6 (8)	Coding	11 (10)
Digit Span	6 (4)		

Measure of "g": 9, 6, 9 (9, 8, 9)

Conceptualization pattern $8 + 9 + 6 = 23$ ($6 + 9 + 9 = 24$)

Spatial pattern: $10 + 9 + 14 = 33$ ($8 + 9 + 14 = 31$)

Sequencing pattern: $6 + 11 + 8 = 25$ ($4 + 10 + 8 = 22$)

Distractibility Index: $5 + 6$

Logico-mathematical Concepts (stage):

Multiplication of Classes	2 (3)
Inclusion of Classes	3 (3)
Conservation of Number	3 (3)
Conservation of Length	3 (3)
Measurement of Length	3 (3)
Seriation	2 (2)

Analysis:

Joseph is functioning in the borderline range of intelligence in most verbal areas, but performance ability is within the low normal range. Except for the Vocabulary score, the conceptualization pattern ($8 + 9 + 6$) indicates potential for somewhat higher functioning in the verbal areas. The spatial pattern is normal and homogeneous ($10 + 9 + 9$) but there is one very low score in the sequencing pattern, Digit Span. Arithmetic (5) when combined with Digit Span (6) is indicative of distractibility (Cohen, 1959), and indeed Joseph is hyperactive in speech and motor areas. Except for two areas, he is functioning at the concrete operational level.

II. *Language Data:*

PPVT Mental Age: 12-1 (12-9); IQ: 90 (91)

Wepman Auditory Discrimination Test: no errors

ITPA: P.L.A.: 10-1 (10-11)

Automatic-Sequential Level

	<i>Auditory</i>	<i>Visual</i>
Memory	8-8 (8-8)	10-5+ (10-5+)
Closure:		10-6+ (10-6+)
Auditory	9-4 (10-0+)	
Sound Blending	8-7+ (8-7+)	
Grammatic	8-10 (9-8)	

Representational Level

	<i>Auditory</i>	<i>Visual</i>
Reception	9-10 (9-6)	10-10+ (10-10)
Association	10-11 (10-11)	10-3+ (10-3+)
Expression	10-11+ (8-7)	10-4 (10-4+)

Analysis:

On the ITPA, only four subtest scores are below the upper limits of the test, and all are in the auditory channel: Auditory Sequential Memory, Closure and Reception, and Grammatic Closure. Receptive vocabulary is within the average range and auditory discrimination is normal. Visual language abilities are at the upper score limits for the test.

III. Spatial Data:

Purdue Perceptual Motor Survey: all subtest scores at upper limits for the test

Harris Test of Lateral Dominance: he is completely right dominant

Representational space (stage):

Localization of Topographical Positions: 3B (3B)
 Concepts of Left and Right: 2 (2)

Frostig DTVP: all scores are at upper levels for the test

Draw-A-Man IQ: 72 (81)

Bender Gestalt Test: 75 (82)

Analysis:

Three areas are below the norms for his chronological age level: concepts of left and right, Draw-A-Man IQ and Bender Gestalt Test score. All other aspects of spatial development are normal.

IV. Social Data:

Coordination of Perspectives: stage 3B

California Test of Personality:

Except for Sense of Personal Worth, Personal Adjustment scores are within normal limits. The low area did not change at posttest. All areas of social adjustment are within normal limits.

Activity Level: He is hyperactive in motor and speech output but approached a normal activity level at posttest.

Vineland Social Maturity scale: Social Age: 15.0 (16.0)

Social Quotient: 105 (108)

Analysis:

Except for hyperactivity and disruptive behaviour in the classroom, Joseph is well adjusted socially. His self concept appears low.

V. Academic Data:

Word Attack Skills	3.5 (3.7)
Paragraph Meaning	3.5 (3.2)
Spelling	2.5 (3.4)
Arithmetic Concepts	2.7 (5.0)
Computational Skills	3.0 (4.6)

Arithmetic Diagnosis:

Basic counting and place value concepts are understood, although the latter does not extend beyond 10,000. Understanding of properties of the natural number system is limited to the two most elementary properties but was extended to include two additional laws at posttest. Computational skills are limited to addition and subtraction, including carrying and borrowing. At posttest addition, subtraction, multiplication and division with whole numbers were understood but did not extend to the level of fractions and decimal fractions.

Reading Diagnosis:

Phonic skills include use of consonants and blends in the initial, medial and end position of words, and use of long vowels. Short vowels are often confused and rules are not understood. In spelling, he is attempting to use a phonetic attack process but with little success.

Analysis:

Joseph's Mental Age on the Stanford Binet is 11 years 2 months. Using a rough estimate of age to grade (e.g. most six year olds are in grade one), he should be achieving at fifth to sixth grade level. He is therefore underachieving by two to three years for his mental age. Arithmetic concepts and spelling are the two lowest areas of achievement. Diagnosis of his reading skills places him at low grade two in phonetic skills with slightly better reading comprehension. Comprehension skills were usually limited to visual clues, e.g. interpretation of pictures. Diagnosis of arithmetic skills also places him at the grade two level in all but understanding laws of the natural number system, where he is functioning at the grade one level. His natural approach to spelling is phonetic attack but skills are limited to use of consonant sounds and long vowels.

Diagnosis:

Joseph is functioning in the slow learning range with most verbal skills and low normal to normal range in most nonverbal areas. The profile is

consistent with the general description for intellectually borderline children. However, earlier cumulative record data describing his performance are suggestive of a developmental learning disability. The majority of these characteristics have now disappeared. In the writer's clinical experience this is not an uncommon pattern, particularly for boys manifesting what appears to be mainly a behavioral problem in grades four to six. Several characteristics of this pattern are still manifest: evidence of distractibility as measured by the WISC; a memory and/or sequencing problem in the auditory channel; moderate disabilities in auditory and grammatic closure and auditory reception; retarded development in the concepts of left and right; low scores on the Draw-A-Man and Bender Gestalt Tests. In summary, Joseph's problems with verbal material appear to stem from his auditory memory and reception deficits. When combined with the deficits in visual-motor integration, cognitive space (concept of opposition of left and right), distractibility and preoperational thought, he seems unable to apply his areas of strength. His negative attitude towards school is compounding the problem.

Psychoeducational Program:

1. A program to remediate deficits was designed in keeping with the C.A. of 14-3:
 - a. Exercises from Bush and Giles (1969) were administered twice a day for five minute periods, to remediate auditory sequential memory. (There was no change from pre to posttest).
 - b. To remediate grammar and syntax and auditory reception, the Mott Language program (1967) was administered. (Auditory Reception dropped slightly from 9-10 to 9-6, but Grammatic Closure showed a gain of ten months to 9-8). To remediate auditory closure and integrate this skill with sound blending, the Kirk-Hegge phonic drill exercises (Kirk, Kirk and Hegge, 1965) were used. (Auditory Closure increased to the upper limits of the test and Sound Blending was at the upper limit at pretest).
 - c. Since motor development was normal, he continued with the regular sports and physical education program of the school. When situations presented themselves (or were deliberately set up), attention was called to the notion of left-right as relative rather than absolute, however, he did not improve in this area.
 - d. To remediate visual-motor integration, advanced exercises in Tangramath were used and supplemented by the Fitzhugh 104 program in Spatial Organization (Fitzhugh, 1969).
2. An academic program was also designed:
 - a. The Kirk-Hegge phonic drills were used to increase word attack skills. The Reader Digest Skill Builders were used for reading comprehension skills. As a result of a lesson in the use of the dictionary, he became very interested in syllabication skills and used the dictionary consistently to discover the meaning and pronunciation of new words. The interest was encouraged and further instruction was given. Phonic rules were also taught for spelling.

- b. The Fletcher Mathematics Program (Fletcher, 1970) was used for mathematics instruction.

Follow-Up:

Except for an increase of four IQ points on the Stanford Binet and three points on the WISC performance IQ, test performance on standardized intelligence tests changed very little. He remained within the borderline range in verbal intelligence. There were slight increases on the ITPA but only in Auditory and Grammatic Closure. Scores on the Draw-A-Man and Bender Gestalt Tests increased from 72 to 81 and 75 to 82 respectively.

Subjective comments from teachers indicated a very substantial change in attitude towards school. His attendance at school increased dramatically. He and the other children in his age group became very interested in the lower levels of the Fletcher Mathematics Program being taught to younger children and they developed several new manipulative materials for them. Social age increased by one year.

The greatest measured increases occurred in academic subjects. Spelling grade increased by nine months, arithmetic concepts by 2 years 3 months and computational skills by 1 year 6 months. Reading skills showed very little change. At the end of the school year he was transferred to a work-study vocational program.

CASE STUDY VI: EDWARD, C.A.: 12-3

Edward, one of the older children, presented a somewhat different profile from Joseph. Pre and Posttest scores are presented together.

I. Intellectual Data:

Stanford Binet: Mental Age: 9-0 (9-2); IQ: 75 (74)

WISC Verbal IQ: 81 (84); Performance IQ: 72 (74)

<i>Verbal Subtests</i>		<i>Performance Subtests</i>	
Information	6 (6)	Picture Completion	6 (7)
Comprehension	7 (6)	Picture Arrangement	7 (6)
Arithmetic	6 (6)	Block Design	5 (4)
Similarities	10 (10)	Object Assembly	7 (7)
Vocabulary	6 (11)	Coding	5 (7)
Digit Span	6 (5)		

Measures of "g": 10, 6, 5 (10, 11, 4)

Conceptualization pattern: 7 + 10 + 6; (6 + 10 + 11)

Spatial pattern: 6 + 5 + 7; (7 + 4 + 7)

Sequencing pattern: 6 + 5 + 7; (5 + 7 + 6)

Distractibility Index: 6 + 6; (6 + 5)

Logico-Mathematical Concepts (stage):

Multiplication of Classes	3 (3)
Inclusion of Classes	2 (3)
Conservation of Number	3 (3)
Conservation of Length	3 (3)
Measurement	3 (3)
Seriation	2 (2)

Analysis:

Edward is functioning within the mildly retarded range of intelligence in both verbal and nonverbal intelligence, although verbal intelligence is somewhat higher than nonverbal. Within the conceptualization pattern, Similarities at 10 is in the normal range, while Comprehension and Vocabulary are in the retarded range. The spatial and sequencing patterns are both within the retarded range with little difference within the patterns. He is functioning at the concrete operational level except for inclusion of classes and seriation.

II. Language Data:

PPVT Mental Age: 10-7 (10-10); IQ: 92 (88)

Wepman Auditory Discrimination Test: 2 X errors

ITPA: P.L.A.: 8-1 (8-6)

Automatic-Sequential Level

	<i>Auditory</i>	<i>Visual</i>
Memory	6-10 (6-0)	7-3 (7-10)
Closure:		8-3 (9-4)
Auditory	9-4 (10-0+)	
Sound Blending	8-2 (8-7+)	
Grammatic	8-2 (8-10)	

Representational Level

	<i>Auditory</i>	<i>Visual</i>
Reception	9-10 (9-2)	7-9 (7-9)
Association	8-10 (8-10)	8-10 (10-3+)
Expression	7-10 (8-7)	7-6 (7-2)

Analysis:

There is an overall deficit in language, except for receptive vocabulary, auditory discrimination and sound blending. The scores are low and narrow in range, 6-1 to 8-7, with the lowest scores in Auditory Sequential Memory, and Visual Sequential Memory (6-10, 7-3 respectively). Except for concentration of the lowest scores in the auditory channel, no pattern emerges but one of severe language disability.

*III. Spatial Data:**Purdue Perceptual Motor Survey:*

Balance and Posture	3 (3)
Body Image	2 (3-4)
Perceptual Motor Match	4 (4)
Ocular Control	3-4 (4)
Form Perception	4 (4)

Harris Test of Lateral Dominance:

Hand Dominance:	Right (Right)
Foot Dominance:	Mixed (Right)
Eye Dominance:	Left (Right)

Representational Space (stage):

Localization of Topographical Positions:	3A (3B)
Concept of Left and Right:	2 (3)

Frostig DTVP:

Eye-Motor Coordination	10+ (10+)
Figure Ground	8-3 (7-0)
Form Constancy	6-0 (7-0)
Position in Space	8-9 (8-9)
Spatial Relations	8-3 (8-3)

Draw-A-Man IQ: 63 (67)

Bender Gestalt Test: 36 (68)

Analysis:

Perceptual motor skills are splintered with immature functioning in Balance and Posture, Body Image, and Ocular Control. Dominance is inconsistent and one area of visual perception is retarded, Form Constancy. Body Image seems particularly deficit: Body Image at 2 and Draw-A-Man IQ at 63. Visual-motor integration seems intact. While performance is very erratic, up one day and down the next, the following pattern is interpreted: deficit in motor development centered around body knowledge and balance and posture; recognition of form; mixed lateral dominance. Cognitive understanding of space seems intact.

IV. Social Data:

Coordination of Perspectives: stage 1B, which remained unchanged at posttest

California Test of Personality: All areas of personal and social adjustment are within normal limits

Activity Level: hyperactive in volume of motor movement

Vineland Social Maturity Scale: Social Age: 13.2 (14.4);
Social Quotient: 107 (112)

Analysis:

Activity level is high and he is functioning at an egocentric level.

V. Academic Data:

Word Attack Skills	4.1 (5.4)
Paragraph Meaning	2.6 (3.8)
Spelling	5.4 (5.7)
Arithmetic Concepts	2.3 (3.0)
Arithmetic Computation	3.8 (3.3)

Diagnostic Tests:

(a) Reading: At the mental age of 9-0 (if accurate) Edward should be functioning at approximately the grade IV level. Using this gross estimate, paragraph meaning and arithmetic concepts are the areas of academic deficit. Word attack skills are adequate but comprehension skills are not developed and guessing is the usual method used. Spelling skills are adequate and he applies phonic rules well.

(b) In arithmetic, counting and place value concepts are at appropriate levels but understanding of laws of the natural number system is almost nil. Computational skills are limited to simple addition, subtraction and multiplication. Except for inclusion of classes and seriation he is concrete operational.

Diagnosis:

1. There is a general deficit for verbally presented material. Verbal scores overall are low but there is a particular problem in vocabulary and comprehension, auditory sequential memory, closure and reception. Receptive vocabulary and auditory discrimination are normal. Non-verbal abstracting may also be a deficit area: Block Design is 5 and Visual-Motor Association is 8-0.
2. There is a deficit in memory and sequencing in both channels and for both meaningful and nonmeaningful material.
3. There is a deficit in spatial-motor functioning centered around body knowledge and balance and posture. Visual-motor integration and cognitive space are apparently normal. There is mixed information on his ability to recognize form: the Form Constancy score is low but Form Perception and Bender Gestalt figures are reproduced accurately. Dominance is mixed. Except for Form Constancy, visual perception seems intact, although Visual Closure on the ITPA is low. Performance is so erratic in this area the picture keeps shifting.
4. Except for the degree of egocentricity and hyperactivity, social adjustment seems normal.
5. Considering the supposed extent of disability, academic skills are surprisingly well developed. Two most severe areas of deficit centre around comprehension: reading comprehension and arithmetic concepts.

Psychoeducational Program:

1. An intensive language program was implemented:
 - a. The advanced level of the Peabody Language program (1965-67) was administered in order to remediate language at the representational level.
 - b. Kirk-Hegge drills (Kirk, Kirk and Hegge, 1965) were used to develop Auditory Closure and integrate this skill with the strength in Sound Blending. To remediate memory, exercises from Bush and Giles (1969) were used.
 - c. A program in motor development, the Chaney Kephart program (1969) was administered concurrently with the language program. The Fitzhugh Spatial Organization Series (101, 102 and 104), supplemented by Tangramath exercises were used to remediate form perception and visual closure.

2. The academic programs followed were:
 - a. a basal reading program supplemented by the Reader Digest Skill Builders to develop comprehension skills;
 - b. the Fletcher Mathematics program (Fletcher, 1970).

Follow-Up:

IQ scores changed very little, however, the WISC Vocabulary scaled score increased from 6 to 11. Inclusion of classes developed to the concrete operational level. Most of the language scores also remained unchanged. Several language scores decreased: Auditory Sequential Memory, Visual-Motor Association. There were moderate increases in Visual Sequential Memory, Visual Closure, Auditory-Vocal Association and Vocal Expression, and fairly substantial increases in Grammatic Closure, Auditory Reception and Motor Expression.

There was improvement also in body image and ocular control, and understanding of concepts of left and right increased to stage 3. The scores on the DTVP were erratic and the score on the Bender Gestalt Test decreased. The level of hyperactivity was reduced and activity approached a normal level.

The major increases were in academic achievement. Word attack skills increased 1 year 3 months, reading comprehension by 1 year 2 months, arithmetic concepts by 7 months and spelling by 3 months. On the Stanford Achievement Test, Arithmetic Computation grade decreased to 3.3 but on the diagnostic arithmetic test, addition, subtraction, multiplication and division problems were solved at the grade IV level.

CASE STUDY VII: JIMMIE, C.A.: 10-11

Jimmie typifies the children for whom psychoeducational diagnosis and programming were of dubious value. The interpretation of the data used for programming is presented first. Following this presentation, the interpretation will be modified with "hindsight" learned through the experience of earlier programming. Pre and posttest scores are presented together.

The most notable characteristic of this child was his constant pacing. He simply could not sit still. When he was sitting, his feet were moving and his hands were tapping or fiddling with some object. The hyperactivity was generally confined to motor and skeletal movements. He did not disturb other children nor seek attention. He seldom initiated conversation and occasionally he reacted explosively to frustration. Academic skills were non-existent, although he was almost eleven years of age and had been attending school for five years. His performance was erratic (a skill known one day was forgotten the next) and his behavior was "driven" and hyperkinetic.

I. Intellectual Data:

Stanford Binet: Mental Age: 7-4 (7-0); IQ: 68 (64)

WISC Verbal IQ: 63 (77); Performance IQ: 79 (75)

<i>Verbal Subtests</i>		<i>Performance Subtests</i>	
Information	4 (4)	Picture Completion	8 (5)
Comprehension	8 (6)	Picture Arrangement	4 (8)
Arithmetic	0 (5)	Block Design	8 (8)
Similarities	6 (11)	Object Assembly	8 (6)
Vocabulary	3 (7)	Coding	7 (5)
Digit Span	6 (5)		

Measures of "g": 6, 3, 8 (11, 7, 8)

WISC Patterns:

Conceptualization pattern: 8 + 6 + 3 (6 + 11 + 7)

Spatial pattern: 8 + 8 + 8 (5 + 8 + 6)

Sequencing pattern: 6 + 7 + 4 (5 + 5 + 8)

Distractibility Index: 0 + 6 (5 + 5)

Logico-Mathematical Concepts (stage):

Multiplication of Classes	3
Inclusion of Classes	3
Conservation of Number	3
Conservation of Length	3
Measurement	1
Seriation	1

Analysis:

The psychometric data indicate Jimmie is a mentally retarded child. Although his behavior is typical of "Strauss syndrome" children, the performance IQ is 16 points higher than verbal IQ and the spatial pattern is homogeneous and within normal limits. Three of the verbal subtests and one performance subtest are particularly low: Arithmetic, Vocabulary Information and Picture Arrangement. Except for Picture Arrangement the performance subtests are in the low normal range. The results are erratic and contradictory. Verbal scores are very low, yet, he is operational in classification ability and two of the number tasks. Although he is conserving number and length, performance on the WISC Arithmetic subtest is almost nil. He behaves like a spatially impaired child, yet spatial organization as measured by the WISC is within normal limits. The picture is one of erratic, driven, hyperactive, distractible behavior.

II. Language Data:

PPVT Mental Age: 8-11 (10-0); IQ: 83 (86)

Wepman Auditory Discrimination Test: 4 X errors

ITPA: P.L.A.: 7-0 (7-9)

Automatic-Sequential Level

	<i>Auditory</i>	<i>Visual</i>
Memory	4-2 (5-3)	5-10 (6-10)
Closure:		10-5 (8-9)
Auditory	6-5 (5-9)	
Sound Blending	8-2 (8-7+)	
Grammatic	6-8 (6-8)	

Representational Level

	<i>Auditory</i>	<i>Visual</i>
Reception	8-10 (8-10)	7-4 (7-4)
Association	6-3 (9-4)	6-0 (7-0)
Expression	7-10 (8-10)	6-1 (7-11)

Analysis:

Receptive vocabulary development is somewhat higher than vocabulary defining ability on the WISC. Performance on WISC Vocabulary is limited to one-word answers. Auditory discrimination appears to be intact. There may be an abstracting disability: Auditory-Vocal Association and Visual-Motor Association are 6-0 and 6-3, and Grammatic Closure is 6-8. Sequential memory is very retarded. Visual Reception and Motor Expression are also low, 7-4 and 6-1 respectively. The picture is one of severe language deficit with specific areas of even greater deficit.

III. Spatial Data:

Purdue Perceptual Motor Survey:

Balance and Posture	2 (3-4)
Body Image	2-3 (3-4)
Perceptual Motor Match	3 (3)
Ocular Control	3 (4)
Form Perception	3 (4)

Harris Test of Lateral Dominance: He is completely right dominant.

Frostig DTVP:

Eye-Motor Coordination	7-9 (8-6)
Figure Ground	5-9 (7-0)
Form Constancy	5-6 (6-3)
Position in Space	6-3 (8-9)
Spatial Relations	6-0 (7-6)

Representational Space (stage):

Localization of Topographical Positions:	2B (3A)
Concepts of Left and Right:	1A (1A)

Draw-A-Man IQ: 67 (69)

Bender Gestalt Test: 75 (71)

Analysis:

Spatial development in general is very deficient and motor development is very retarded. Again there is conflicting data: he is completely right dominant, yet, he does not know left and right on his own body. Visual perception, visual-motor integration and representational space are also deficient, yet the WISC spatial pattern is normal. This is one case where the WISC did not prove valuable in pinpointing a problem in spatial development. His understanding of left and right is very retarded, since he does not yet know left and right on his own body. He can copy left-right, top-bottom positions when they are on the same plane but not when the positions must be reversed. (He has great difficulty crossing the midline of the body and these two disabilities may be different manifestations of the same disorder.) The Bender Gestalt figures were grossly distorted when drawn. He is unaware that there are distortions and since the Form Constancy score is also low, it is questionable that he is able to perceive visual differences in shapes.

IV. Social Data:

Coordination of Perspectives: stage 1A (2A)

California Test of Personality:

The areas of personal adjustment are within the low normal range except for Sense of Personal Worth at P_{20} and Feeling of Belonging at P_{10} . They remained unchanged at posttest except for Feeling of Belonging which increased to P_{30} . Only one area of social adjustment was within normal limits at pretest, Social Skills at P_{70} , and generally the areas of social adjustment remained unchanged at posttest.

Activity Level: 1.00 — extremely hyperactive

Vineland Social Maturity Scale: Social Age: 5.2 (8.8); Social Quotient: 47 (75)

Analysis:

Jimmie is very withdrawn, hyperactive and has few social skills. He dislikes school and makes very little contact with his peers.

V. Academic Data:

Metropolitan Readiness Test:

Word Meaning	B (C)
Listening	C (C)
Matching	B (B)
Alphabet	C (C)
Number	C (B)
Copying	C (B)
Total Readiness	C (B)

Number Ability: Limited to rote counting, concepts of less than, more than, and equal to, and counting with bundles of tens and ones.

Analysis:

The level of readiness makes it questionable that he can profit from formal academic instruction, indeed, after five years exposure to instruction his academic skills are no better than those of a child entering grade 1. The level of operational thought, however, appears adequate for beginning academic skills. There is severe underachievement in academic skills. There is severe underachievement in academic functioning in terms of both mental age and chronological age.

Diagnosis:

Jimmie's observable behavior is that of a spatially disabled, hyperkinetic child but the WISC scores on subtests thought to be assessing spatial organization ability are within normal limits. The WISC indicates a disability in verbal reasoning and a pervasive memory and/or sequencing deficit. He is unable to answer any items on the WISC Arithmetic subtest indicating a disability in quantitative reasoning, but he is almost completely operational in logico-mathematical tasks. His behavior is that of the classic "Strauss syndrome child", except that performance IQ is significantly greater than verbal IQ.

There is a language disability which seems not to follow any pattern, except possibly a disability in integrating ability: Auditory-Vocal Association, 6-0; Visual-Motor Association, 6-3; Grammatic Closure, 6-8. Sequential memory is very deficient (4-2 and 5-10), Vocabulary is very low, (WISC Vocabulary, 3), but receptive vocabulary is considerably higher (8-11). Auditory discrimination seems to be intact.

Although he is completely right dominant, he does not know left and right on his own body and he cannot handle the simple projective relations, left-right, before-behind, when they must be reversed. Motor development is very immature, especially balance and posture and body image. There is an overall deficit in visual perception and visual-motor integration.

Socially he is withdrawn and hyperactive in the extreme but only in skeletal movement, and social age is in the severely retarded range. Academic skills are non-existent. While IQ scores indicate mild retardation, his performance and social development are more like those of a Trainable Mentally Retarded child (IQ less than 50).

Psychoeducational Program:

1. Because his hyperkinetic behavior so resembled that of the Strauss Syndrome child, the physical environment was structured as much as possible for the instructional sessions: carrels, elimination of all material except those absolutely necessary to lower "visual noise", and audio-taping and use of headphones to filter out background auditory noise.
2. Highly structured Distar teaching programs (Engelmann, 1969) were used for language and arithmetic and behavior modification techniques were used here as well as in other situations.
3. Bush and Giles (1969) exercises were used to remediate memory. Tactile and kinesthetic stimulation were used to supplement auditory and visual stimuli.
4. He worked with a group of three other children in a Rebus Reading Program (1969), a phonics remediation program and for vocabulary development. The three other children completed the Rebus program and transferred very successfully to the Lippincott Reading Program (1970) which emphasizes phonetic skills, but Jimmie could not transfer with the group.
5. He received intensive motor training with the Chaney-Kephart program (1969) on an individual basis and gymnastics training in a group situation.

Follow-Up:

The program resulted in only moderate success. The Stanford Binet and WISC performance IQs dropped by four points but the WISC verbal IQ increased from 63 to 77. At posttest, therefore, the discrepancy between verbal and performance IQ had disappeared. Largest increases occurred in Arithmetic (0 to 5), Similarities (6 to 11) and Vocabulary (3 to 7). Picture Arrangement also increased from 4 to 8 and seriation from stage 1 to 2.

The PPVT Mental Age increased from 8-11 to 10-0 and IQ from 83 to 86. While the P.L.A. (ITPA) increased from 7-0 to 7-9, increases were irregular. Only memory (4-2 to 5-3 and 5-10 to 6-10 for auditory and visual respectively) and association increases were consistent.

Motor scores increased as follows: Balance and Posture, 2 to 3-4; Body Image, 2-3 to 3-4; Ocular Control, 3 to 4; Form Perception, 3 to 4. Perceptual Motor Match remained at 3 and concepts of left and right remained at stage 1A. Stage of development on the localization of topographical positions task increased from stage 2B to 3A, that is, left-right relations were understood but top-bottom relations were not understood when positions to be copied had to be reversed. There were increases on the five Frostig DTVP subtests but only Position in Space increased to the upper limits of the test. Draw-A-Man and Bender Gestalt test scores remained unchanged.

In social development the degree of egocentricity decreased (he progressed from stage 1A to 2A), the percentiles on the California Test of Personality remained approximately the same, activity level decreased by one level, and Social Age and Social Quotient increased to 8.8 and 75 respectively. Readiness scores increased from C to B and the two most elementary laws of the number system were known, otherwise academic achievement remained unchanged. Initiation in a formal reading program was unsuccessful. In summary, while increases did occur on the psychoeducational tasks, skills did not transfer to social development or academic achievement.

Revised Diagnosis:

From the psychometric data, Jimmie appears to be a mildly retarded child, yet he is functioning like a severely retarded child. At his level of intellectual ability and Mental Age, he should be reading and understanding numbers at least at a grade two level but academic skills are non-existent. The level of intellectual functioning simply does not warrant the degree of academic disability manifested by this child. He also has several areas of strength on which he should have been able to capitalize but he did not: logico-mathematical concepts are at a developmental level necessary for acquiring initial academic skills; the spatial pattern on the WISC is within normal limits; visual closure ability appears to be commensurate with his chronological age. He should have responded to instruction.

Jimmie's most serious disabilities seem to be concentrated in two broad areas. He appears to have a severe deficit for quantitative reasoning and he cannot read. The behavior and test profile closely resemble the acalculic child frequently described in the research literature. Acalculia is defined as a disturbance in the ability to do simple arithmetic.

The characteristics reported in the literature for the syndrome of acalculia are manifested by Jimmie: hyperactive, distractible behavior; inability to cross the midline of the body and a deficit in body awareness; a visual-motor integration deficit. In addition to these disabilities, Jimmie also has a severe deficit in most areas of visual perception, an inability to copy left-right and top-bottom projective relations when they must be reversed, a severe disability in abstracting from verbally presented materials, and disabilities in memory and sequencing and auditory closure. The latter disabilities are probably more closely related to the inability to read than to the acalculia.

The prognosis for children like Jimmie does not appear to be hopeful. The few cases described in the literature where attempts have been made to treat acalculia have been discouraging (Cohn, 1971; Koppitz, 1971). Combined with the seeming inability to learn to read, the problem is compounded. These are the children for whom psychoeducational tests, knowledge in programming, and basic data on development must be vastly increased. The present level of knowledge does not bode well for helping these children.

SUMMARY: PRINCIPLES FOR PSYCHOEDUCATIONAL PROGRAMMING

It is impossible to include a full description of the teaching program. It is hoped, however, that the preceding and fairly detailed case studies will assist the reader in understanding how the concept of psychoeducational programming was interpreted and applied in the present study. The following is a summary of the principles considered most important.

From test results, a fairly lengthy period of observation and input from the child's teacher, a profile of the child's strengths and weaknesses was determined. Remedial programs designed to ameliorate or alleviate areas of deficit were then devised. In choosing academic programs, attempts were made to select programs which stressed the child's areas of strength. As areas of deficit improved, the new skills were incorporated into the teaching of academic subjects in order to teach for transfer and to demonstrate to the child that the skills being learned could and should be used in a meaningful context. Consequently, there was a continuous evaluation and reorganization process going on.

Whenever possible, children were taught in groups. Occasionally the majority of children in a group would make progress, but one child would not. For example, four children in experimental group I formed one group for remediating auditory channel skills (auditory closure, sound blending, auditory memory and discrimination). Specific exercises thought to be applicable in remediating these areas were administered. A basic phonics program stressing beginning, ending and medial sounds accompanied this remediation. During the same period, the four children were taught a reading program which emphasized a visual approach: the Peabody Rebus Reading program (1969). At the point when it appeared they could incorporate the basic skills taught in the remedial program, they were introduced to a reading program which emphasized phonetic skills, the Lippincott Reading Series (1970). Three of the four children were immediately successful and able to transfer skills. The fourth, Jimmie, discussed in the previous section failed completely.

Generally it can be stated that hyperactive children were given programs which emphasized structure and eliminated as much as possible unnecessary stimulation, and vice versa. Behavior modification was used when it was considered appropriate. One interesting result of behavior management occurred. Three hyperactive children were assigned to a resource teacher who remained calm and in control whatever limits were being tested. By May, all three children had learned to work in unstructured situations and exhibited hyperactivity only when unusual events occurred. These children were able to work in group situations and friction with their peers at work and play was considerably reduced. It was not possible for these children to work in groups at the beginning of the project. On the other hand, several hypoactive children were taught by a very outgoing, gregarious and "noisy" resource teacher and their activity level moved upwards towards normal. This finding points to an interesting possibility, that is, matching children with teachers whose personalities are best suited to working with a particular type of child.

It can be stated as a general rule that children with "fragmented or splintered" skills were given programs which supposedly divided the area according to the various skill components of that area. For example, children whose language scores on the ITPA and Wepman pointed to a specific area of deficit such as low scores on auditory discrimination and sound blending would follow a program to remediate those areas of deficit. On the other hand, where all the scores in an area were relatively homogeneous, the child would follow a more global program, for example, a child with a language disability in the auditory channel at the representational level would follow a program such as the Peabody Language program (1965-67).

One group, Experimental Group I, had the prescriptive motor program supplemented with a gymnastics program. The program was very successful and could be used with all the children in the class. The teacher, aware of a specific motor disability in a particular child, simply provided specific instruction when a task involved using the area of deficit.

Care was taken that workbook materials and exercises would not become "busy work". For example, in using the Thurstone Learning to Think Series (1972), children were required to verbalize each step of the process involved in selecting correct answers and then to explain why other distractors were incorrect. An exercise might require the child to find the figure in a group of four which was exactly the same as the one in the starter box. Distractor 1 might be the same except for orientation; distractor 2 might differ only in size, while number 3 might differ in several dimensions. Distractor 4, the correct one, would be compared along a number of dimensions to "prove" it was exactly correct, while the others would be analyzed to determine why they were incorrect. This approach was followed for several reasons: to condition children in problem solving strategies, to establish careful work habits, to teach dimensions for comparison and discrimination, and to teach children how and why they must justify decisions.

Several of the tests used were accompanied by remedial programs, e.g. the Frostig Developmental Test of Visual Perception. Such programs generally teach to test items, consequently, test scores may increase without a corresponding increase in the deficit area, while inability to transfer the skill could continue. Apart from the fact that no real learning may occur, the area of deficit becomes "hidden" and a good diagnostic test is of no further value. The project directors attempted to get around this difficulty by analyzing the essential skill(s) being assessed by the test or subtest, and designing exercises which incorporated the skill. The skill was then taught in the context of meaningful application. This procedure was followed rigorously for development of visual perception and visual-motor integration.

One exception to the rule of not teaching to test items, was the use of the Chaney-Kephart program (1969), *Motoric Aids to Perceptual Training*, which teaches to areas of deficit as defined by the test, the Purdue Perceptual Motor Survey. The Chaney-Kephart program was used extensively for children with splintered motor and perceptual-motor skills, however, the only group showing significant improvement at posttest was the group where deficit areas were also remediated through the gymnastics program. A second exception involved

teaching skills assessed at the automatic-sequential level on the ITPA. Sequential Memory, Auditory Closure, Sound Blending were remediated directly with exercises such as those found in the Bush and Giles book, *Aids to Psycholinguistic Teaching* (1969). While the VAKT approach (combining visual, auditory, kinesthetic and tactile senses) was used frequently in modifying the exercises, basically the exercises were similar to test items. The approach is not being defended. The project directors simply did not have an alternate approach at that time. More recent research indicates other, and probably more valuable, approaches to remediating memory.

Whatever the exercise, establishing problem-solving strategies was the basic objective. For example, the Fitzhugh Spatial Organization Series (1969) was one program used to teach recognition of form. Three areas of spatial organization are included in this series: shape matching, shape completion, and shape sequencing and analysis. One type of exercise is to select from four distractors, the shape required to complete a stimulus shape. The child was required to compare length of side, size of angle, number of sides required in the distractor shape, orientation, etc., and to verbalize the strategy he was using to make his selection. At a later stage, he would be asked to anticipate the most economical number of comparisons required to arrive at a correct answer. If he was unable to handle the two-dimensional tasks, the same type of drill was given, only with three-dimensional shapes from programs such as Tangramath.

Care was taken that older children were exposed to reading materials at their interest level. Exercises as well as content were modified so they differed from those given to younger children, even though both children might manifest the same disability and be functioning at the same reading level.

Whenever possible, global type programs were used, rather than piece-meal exercises. For example, meaningful language was treated as a whole, rather than teaching specific exercises in reception, association, or expression. Children were encouraged to use various forms of expressions, e.g. one child might tell a story pantomimed by another. They were encouraged to accompany verbal expression with motor expression. They would alternate in describing objects and guessing what they were. Art work such as drawing and finger painting was used to retell stories told or read to them. Exercises in divergent and creative thinking modes were worked into language lessons. Puppetry, shadow pictures and pantomiming were used to develop expression.

Many of the materials used in the study have been referred to in the case studies under psychoeducational programming. The materials used most often will be discussed under the five areas included for assessment and programming, however, a word of caution is necessary. Many different materials will be equally satisfactory or unsatisfactory. What is important is not the materials or programs per se, but the manner in which they are used. For example, the best workbooks are useless if their only purpose is to keep children "busy" or if the child is merely guessing or rushing through to complete the assignment, rather than to teach or reinforce a concept. The teacher is the key factor and many of the most creative lessons in the project were taught with simple, inexpensive teacher-made materials.

I. Programming for Intellectual Development:

Two general areas were considered in attempting to develop intellectual functioning, general intelligence and operational thought as defined in Piagetian terms. Key concepts in general intelligence were thought to be abstracting ability, both verbal and nonverbal, and comprehension of spoken and visual information. Related to and probably underlying these abilities are the abilities to discriminate, sequence, compare and contrast, to perceive both visually and auditorially, etc. The underlying abilities were generally considered as part of language and perceptual-motor functioning. To develop general intelligence the general rule was to expose the child to as many experiences as possible and to teach him how to abstract information from those experiences. In that sense, every aspect of the program was intended to increase general intellectual functioning. The ability to ask and answer questions, to generalize and integrate information, to verbalize rules and conclusions, and to develop problem-solving strategies were primary objectives of all programs administered. For younger children especially, the *Thurstone Learning to Think Series* (1972) proved very valuable. For all children carefully structured visits to gain experiences, as well as films, film strips, books, magazines and other sources of information proved valuable. The key objective in all these presentations was to prepare the child concerning what he should look for and to guide him in verbalizing and arriving at conclusions as part of the follow-up. Games where the child had to determine what was funny, bizarre, foolish, etc. were not only valuable but motivating. Picture stories which had to be sequenced to tell a story or variations of a story also proved valuable. Boys particularly enjoyed solving mystery stories by looking for clues, sequencing events and logically seeking solutions.

The development of children's thought to the stage of concrete operations was also an important objective. The tasks used to assess stage of development were never used for this purpose. The format suggested by Sigel (1967) was employed, for example, presenting the child with experiences which forced him to see that what he "thought he was seeing" was not always correct. One such exercise might be to make two identical balls of plasticine, to change the shape of one ball and then to weigh the two to see if one had really changed in amount as they had decided. Another sample exercise was to place a pile of different colored pencils and other writing implements, some of which were red and a number of red objects in front of several children and to direct some of the children to pick up the red objects and other children to pick up the objects that write. When both reached for the red pencils, questions were asked to determine why both children should have the red pencil.

A great deal of time was spent in teaching labelling and classification categories, for example, exercises were used such as describing, comparing and contrasting several kinds of fruit and deciding why they could stand alone (these are all oranges) and why they could go together (apples, oranges and bananas are all fruit).

An important part of developing operational thought was to increase the child's supply of descriptive words and to provide a form for comparison such

as, this glass is taller but this glass is wider. This type of training, of course, can also be categorized as language development.

One of the mathematics programs prescribed for some of the children also contributed to development of conservation and operational thought, the Fletcher Mathematics program (Fletcher, 1970). The program is intended to teach mathematics with understanding through a discovery method and use of concrete materials to illustrate mathematical relationships.

II. Programming for Language Development:

Programming for language development was determined by the pattern of deficits interpreted from the four diagnostic tests of language ability. Overall language deficit was one pattern found, although not the most prevalent. When scores were uniformly low, a global type of program was administered. The program used most frequently was the Peabody Language program (1965-67). The Peabody program was also used to remediate a representational level deficit.

The Distar Language program (Engelmann, 1969) was also used for children with a general language deficit. The Distar program was used for two types of children. Several children in the study were functioning in the Trainable Mentally Retarded range of intelligence, that is, IQ below 50. The Distar Language program, Level I or II depending upon the degree of language disability, was administered to these children. Several very hyperactive children with poorly developed language skills also were instructed with the Distar program because of its highly structured approach.

Channel deficits at the representational level were treated by using the area of strength to assist in developing the area of deficit. The Peabody Language program has valuable exercises for developing both visual and auditory language, however, any program involving auditory or visual stimulation seemed to transfer to improvement of channel deficits at the representational level.

Deficits at the automatic-sequential level were treated directly. Sequential memory deficits were remediated generally by using exercises from Bush and Giles (1969), aids to Psycholinguistic Teaching, or comparable exercises from a handbook by Merle Karnes (1968) designed for the child below five years of age. Most children did not have difficulty with sound blending but did have difficulty with auditory closure. Exercises to develop these skills were designed so that both skills could be integrated. Surprisingly few children had difficulty with auditory discrimination but when discrimination was an area of deficit, the deficit was usually severe, even for gross sounds. The Sound Order Sense program (Semel, 1970) proved valuable in remediating auditory discrimination and basic phonic skills.

Several programs were used to develop phonetic skills: Sound Order Sense (Semel, 1970) for the youngest children; Talking Alphabet (1967) for the children initiating academic skills; Kirk-Hegge (Kirk, Kirk and Hegge, 1965) drills for the older child. The Mott Language program (1967) also proved valuable for older children for developing language skills at the automatic-sequential level.

Developing vocabulary was considered a major objective in every facet of the program and was required by a majority of the children. For the youngest children, the Peabody Rebus Reading program (1969) with its emphasis on vocabulary development, was useful. Creative and varied use of words was encouraged. Ability to define words by classification was emphasized. Dictionary use proved very motivating for the older children.

Finally, correct use of grammar and syntax was emphasized. Drill exercises emphasizing correct use of tenses, plurals and comparisons were designed. Many interesting language games were available for this purpose.

III. Programming for Perceptual-Motor Development:

Programming for perceptual-motor development followed the interpretation of areas of deficit described in the preceding chapter. One rule-of-thumb generally followed was to teach to specific areas of deficit when development appeared splintered, and to administer global developmental-type programs when the problem appeared to be overall immaturity. The latter pattern was found primarily in the very young and very retarded children for whom two programs were followed: the Cratty Developmental Motor program (1967) and the Frostig, Move, Grow and Learn Motor program (1969). The Chaney and Kephart program, *Motoric Aids to Perceptual Training* (1969), was administered for splintered perceptual-motor development.

The gymnastics program was particularly valuable for developing motor skills: balance, posture and movement; body awareness; coordination of both sides of the body. Other exercises for gross motor development included games requiring the child to skip, run, jump rope, and walk a narrow plank. These skills could be integrated into a variety of outdoor games. For the younger children, games such as Simon says were useful in teaching body awareness. Although not used in the present study, the author has since used yoga exercises successfully with older children, particularly girls, for motor skills, especially body awareness and coordination of the body, and balance, posture and movement. Sports' programs were used in the present study with the older children. Many older children with severe motor problems were very hesitant about participating in group games. To build confidence, games involving only two persons such as miniature golf or table tennis are useful. Swimming is also valuable for teaching coordination but access to a swimming pool was seldom available during the school day.

Games were developed to improve eye-motor coordination, e.g. two children might play a game of jacks where a dozen tiny jacks would be placed on the floor in a straight line and about six inches apart. The children would kneel on the floor about six to eight feet from the line. A small ball about one inch in diameter would be used to knock down the jacks by aiming the ball along the floor. The child capturing the most "soldiers" won the game. "Tracking" games and maze puzzle games were also used to develop eye-motor coordination and ocular control.

Remediation for a visual-motor integration deficit varied for the younger and older children. For the younger children remediation was tied closely to

recognition of form. Tracing stencils of shapes, drawing and cutting shapes, manipulating shapes to see the relationships among shapes, making shapes by using various materials which could not be distorted (for example, placing four Q-tips together to make a diamond), and use of color cues for distinctive features are examples of the numerous games and exercises used to develop form recognition and reproduction.

The Fitzhugh Spatial Organization program (1969) was used with the children over eight years of age. The program includes three areas of spatial organization, shape matching, shape completion and shape sequencing and analysis. The program was used generally with children nine years and over. Emphasis was placed on systematic problem solving and use of rules, e.g., "Compare the number of sides, size of angles, length of sides. Reverse or rotate the form to see whether a change in orientation is required". Three dimensional exercises were also used either to precede or accompany the paper and pencil tasks. The relationship of geometric forms to one another was stressed for all children, e.g. a square can become two triangles by cutting the square along the diagonal.

Motor planning was involved in most exercises on space, but was also taught directly. Drawing scale maps of a room on graph paper, or drawing the floor plan of a school proved motivating for older children. Puzzles in varying degrees of difficulty were also very motivating, particularly for the younger children.

A great deal of time was spent on teaching the concept of opposition of left and right. Young children were given visual cues to help them remember their left and right sides. Verbalization was used to assist children to locate left and right on a person or object opposite to them, e.g., two children stand side-by-side beside a table. One walks around the table. They then discuss what happens to the positions of their right hands (they become opposite). A rule is then formulated — this is my right hand, so your right hand must be opposite my left hand, etc. This "logical" reasoning assisted many children in learning left and right on a person standing opposite. The concept appeared to be the most difficult notion of left and right for the majority of children. Exercises such as locating a hidden object from verbal directions also proved valuable, e.g., "Find the book. It is on the top, left side of the case."

Although an area of deficit for many children, visual closure responded readily to remediation, furthermore, it appears that direct remediation is unnecessary for most children. Remediation of any area of visual perception seemed to transfer to improve visual closure. However, several exercises were successful for children with particularly severe deficits in this area, e.g. dot-to-dot exercises where the figure emerges as the dots are joined; exercises from Book 102, Shape Completion, from the Fitzhugh Spatial Organization Series.

Reproduction of form was also an area of disability for many children. Several of the exercises described for eye-motor coordination proved valuable for teaching reproduction of form (for example, joining Q-tips to make geometrical forms) but basic to the skill is a knowledge of the essential characteristics of geometric forms. For this reason, emphasis was placed on being in the group. They might participate in as many as three or four different groups during the day.

Errors in perceiving position in space was probably the most common perceptual disability found in children under ten years of age. Reversals and rotations of letters and numbers were almost the rule. Strong color cues, verbal cues, directional arrows, finger tracing of felt letters, construction of letters from plasticine are examples of exercises used to remediate this type of disability. While a very common type of disability, remediation was generally very successful.

Much of what has been discussed already can be categorized as developing an understanding of space at a cognitive level, indeed, perceptual disabilities were frequently "talked away" by using verbal information to arrive at correct solutions to problems. Only one area of cognitive space, concept of opposition of left and right, was remediated directly. Projective relations of before-behind, top-bottom were also taught, but not in the format used for the two tests, localization of topographical positions and coordination of perspectives. Primarily, these concepts were taught by having the children play games and calling their attention to changing perspectives with changing positions, or having a child describe what he thought an object looked like from the side or back and then having him check the accuracy of his descriptions.

IV. Programming for Social and Emotional Development:

It was hypothesized that the most lasting results in social and emotional development would be achieved by providing success experiences for the children; providing them with basic skills such as motor skills to enable them to participate in group activities and to interact with their peers; reducing frustrations and giving them strategies for dealing with frustration; changing negative attitudes to school by giving them reasons to enjoy attending school; by helping them to "feel good" about themselves. This approach is, however, a long term goal and it is unlikely that seven months is sufficient time to overcome the negative attitudes built up from years of failure and frustration. For this reason every effort was made to impress upon the teachers participating in the study the need for continuing the objectives beyond the period of the study.

Several general rules were followed in direct programming for social development. Every effort was made to increase social skills to levels commensurate with chronological ages. The Vineland Social Maturity Scale was used as a guide for sequencing the order in which skills were taught. The sequence was particularly valuable for the youngest and most severely retarded youngsters.

Emphasis was placed on teaching acceptable conduct for participating in group games, e.g. taking turns; elimination of crying, fighting, pushing, etc.; sharing of toys. Many children simply withdrew to the sidelines in any group situation. Such children were "paired" with an outgoing, friendly child. If inability to perform a skill seemed to be the problem, efforts were made to teach the skill. Sometimes the teaching was done by a teacher but whenever possible, an older and/or more able child was encouraged to teach the skill.

Timid, withdrawing children were placed in small group situations for instruction and emphasis was placed on working together with other children teaching geometric forms, per se, e.g. an oval is like a circle because _____, but an oval is different from a circle because _____.

Towards the end of the project several of the older girls formed a group to discuss how they might handle problems common to teenagers. The group worked very well and was continued the following year.

The most severe and most prevalent behavior problem was the high incidence of hyperactivity. An attempt was made to ascertain the exact nature of the hyperactivity. It appeared to take two forms: hyperkinetic, driven, distractible behavior commonly associated with learning disability and frequently accompanied by periodic explosions, usually the reaction to some frustration, and attention seeking, immature behavior. While both types of behavior were found in some children, a surprising number exhibited one form or the other. Quite by accident, the Project Directors discovered that children tended to model a teacher's behavior. Modelling appeared to be successful in reducing both hyperactivity and hypoactivity.

Hyperkinetic children were generally given a highly structured physical environment in which to work. Behavior contracts utilizing a precision teaching model sometimes accompanied the structure, when the child could take some responsibility in controlling his behavior, e.g. to decrease random motor or to increase the amount of work done in a given period. Attention-seeking, disruptive children were usually treated in a behavior modification program. Withdrawing children were gradually drawn into group situations at a pace they could handle without causing anxiety. A majority of children moved towards a normal activity level.

While there were several gains at posttest on descriptive tests, the number of positive comments made by teachers and parents provide a more revealing measure of the success of the program. Teachers in regular classes were more willing to integrate the children into one or more of their academic programs. An indirect measure was the decrease in truancy and increase in attendance. Finally, a comment by a child who had previously been absent frequently from school and who had worked consistently all one afternoon was overheard: "Is it half past three already? We just got started." This was a frequent reaction by children who previously had taken every opportunity to stay away from school.

V. Programming for Academic Development:

In the long run, the success of an education program must be measured in terms of how much academic learning has occurred. Academic development was a major objective in the present study.

In general, the rule-of-thumb was to teach to areas of strength while remediating areas of deficit. Three questions were asked: (1) Are skills thought to be prerequisite for particular subject matter intact and sufficiently mature? (2) Are the general measures of readiness indicative of a successful prognosis? (3) From the profile of strengths and deficits does one channel appear likely to be more efficient for learning?

The three types of information were applied in the following manner in teaching arithmetic. It was concluded from a review of research that prerequisite to learning arithmetic was the ability to conserve, that is, to understand that quantity remains invariant regardless of the manner in which the elements are arranged. Furthermore, the concept must be generalized over

a range of materials (continuous and discontinuous), and for both cardinality and ordination. For this reason, stage 3 in conservation of number and seriation was considered necessary for learning arithmetic. Piaget (1941) postulated that number is both class and relation. Stage 3 or operational level thought in multiplication and inclusion of classes were also considered prerequisite for learning arithmetic.

A review of research revealed that arithmetic disability is found frequently among children with spatial disabilities, particularly a disability of visual-motor integration. Several children manifested the syndrome, therefore, emphasis was given to improving spatial functioning in these children. Remedial programs for spatial functioning are described in the previous section.

Determining the channel of greater strength was not as relevant for arithmetic as for reading, since programs have not been developed for arithmetic emphasizing one channel, as they have been developed for reading. Nevertheless, children with visual channel problems tended to manifest a higher incidence of severe arithmetic disability. Since children with visual channel problems tended to be hyperkinetic, the highly structured Distar Arithmetic program (Engelmann, 1969) was administered most frequently for this type of child. Although the decision was made from subjective judgement based on daily observation, the teachers and project directors were not satisfied that true understanding of arithmetic concepts was developing when the rote learning oriented Distar Arithmetic program was followed, however, it did serve the purpose of "settling children down" so that other manipulative centered, discovery oriented arithmetic programs could be introduced at a later time.

The Arithmetic subtest from the Metropolitan Readiness Test was used as one indicator of readiness, and stage of development in the number and classification tests as another. If spatial functioning was not seriously impaired, children still at a prereadiness stage were administered the first level of the Fletcher Mathematics program (Fletcher, 1970). The Fletcher program has the advantage of teaching basic number notions such as equality, more than, less than, sets, cardinal counting, numbers as classes, ordination, etc., through a well sequenced discovery method, but one which is guided closely by the teacher and which seems to speed up development of conservation. Many concrete materials are used for each lesson. Invicta materials proved valuable, but most often simple, inexpensive, teacher-made materials were used. The workbook exercises were valuable but the workbook sheets were rather small and cramped for many children.

For older children who were conserving, the sequence in the upper levels of the Fletcher series was followed generally, and concrete materials were used extensively to teach concepts. Emphasis was placed on developing understanding of the four basic processes, simple fractions, and measurement, since most children would be placed eventually in special vocational high schools. The older children tended to have a fragmented understanding of arithmetic, e.g. they could add and multiply but could not subtract or divide, or a process might be partially understood but errors would occur for a specific reason such as incorrect placement of numbers of columns. The arithmetic diagnostic test was particularly valuable for pinpointing idiosyncratic errors, e.g. several children were adding columns such as 24, 33,

11 and getting the answer 14. Wild guessing by the child might be considered the reason until he verbalized that he was adding down one column and up the other: $4 + 3 + 1 + 1 + 3 + 2 = 14$. Place value was a common source of errors and a specific diagnosis for each child helped pinpoint the source of difficulty.

The middle group of children, those who were just initiating number skills, were administered a similar type of program but sequencing of content was followed much more closely. This age group tended to have gaps in their understanding of counting concepts and place value.

Most children had little or no understanding of the laws of the natural number system. Teaching for understanding was a basic goal for all number programs.

Before selecting a reading program, the same general steps were followed as for arithmetic, except that more attention was given to determining a channel of strength. Performance on the Frostig DTVP subtests, the Visual Closure subtest on the ITPA, WISC Picture Completion, and the Bender Gestalt test were examined for evidence of the visual perception and visual-motor integration problems which might affect reading ability. Auditory Closure and Sound Blending on the ITPA, and the Wepman Test of Auditory Discrimination were examined for evidence of auditory perception problems which might affect reading ability. Particular attention was given to measures of short term memory for both channels.

When visual perception problems were particularly severe but there was evidence auditory skills or potential were intact, a strong phonetic oriented reading program was followed for children who appeared ready for a formal reading program. The Metropolitan Readiness test was used primarily to determine readiness level. For children with the same general profile but not yet ready for a formal reading program, and if they were seven years or older, the Peabody Rebus Reading program (1969) was administered. The Rebus program served several purposes. Success was possible, even with children with visual disabilities. It provided a legitimate approach to reading for children who had failed in other reading programs and who were very self-conscious because they could not read. It helped to motivate children for later reading programs, when the necessary foundation of skills was developed. Administered concurrently with the Rebus program was a developmental program in basic phonetic skills. As soon as a foundation of phonetic skills was available, the children were transferred to a phonetically oriented reading program. The Lippincott Reading program (1970) was used for this purpose.

Several children had severe deficits in auditory perception skills. When visual skills were intact, and when children were ready for a formal reading program, visual word attack skills were taught, e.g. configuration, structural analysis, etc. Exercises for teaching visual word attack skills were modelled on examples from a basal reading series. "Reading lessons" were often developed from experience charts, dictated by the children. Several other sources were also used, but they varied depending on the child's age, e.g. younger children were content to read from a basal reader they had not used before; boys were interested in adventure series or mystery stories; older children were interested in short stories from magazines published each week for special classes, and in the Reader Digest Skill Builder series. An intensive

remedial program in auditory word attack skills was administered concurrently and auditory skills were worked into lessons on word analysis as they became available to the child. The remedial programs have been described in the section on language development.

Most children had splintered deficits (and strengths) in both the auditory and visual channels. This type of disability usually responded well to the Fernald (1943) or Gillingham (1970) VAKT approach, that is, a combined visual, auditory, kinesthetic and tactile approach. Visual and phonetic skills were also variously emphasized, depending upon the degree of disability in either channel.

The diagnostic reading tests were used to determine where in the instructional sequence a child should be placed, for example, where one should begin teaching phonetic skills, while the Bottel Reading test was useful in determining the child's instructional, comprehension and listening level for reading.

Reading comprehension skills were assessed informally from a checklist of comprehension skills. Auditory skills were used to remediate visual deficits, and vice versa. Exercises for younger children were modelled on exercises from basal reading series, and used for a particular child. Exercises for older children were included in the magazines and Skill Builders series used for daily reading instruction.

At least one-third of the children were not ready for a formal reading program. Readiness programs for these children have been described in a previous section.

The Edmonton Spelling test (1968) was used to determine the grade level in spelling ability and also the child's preferred method for spelling. Instruction in spelling was given by teaching the child how to apply the skills involved in his preferred method. Where no method was apparent, the rules being taught for word analysis in reading were applied to spelling.

Generally, programs for remediation of basic deficits were administered concurrently with the programs for academic development. Every attempt was made to remediate deficits within the context of academic skills. When this was not possible, the remediated skills were applied as academic skills as soon as possible.

From observation it appeared that deficit areas are more efficiently remediated if the deficit is taught within the context of instructional content which the child (and his teacher) considered relevant. For example, children having difficulty crossing the midline of the body usually were better motivated when remediation was integrated as part of the instruction for a game which required the skill. Gains also tended to be greater when this procedure was followed, than when the deficit was remediated in isolation. Teachers also tended to be more enthusiastic when instructional content was in line with their idea of what should be included in the curriculum. If the observation is accurate, a new approach to curriculum development is necessary. Curricula will have to be analyzed step-by-step in terms of the skills required to understand the content. Methods will have to be devised for teaching "detours" to enable children with specific disabilities to acquire the content. Curriculum development for the exceptional child will have to open and explore many new frontiers.

PART TWO: RESULTS

CHAPTER V INTELLECTUAL DEVELOPMENT

The first analyses were of the pre and posttest scores of the Experimental and the Contrast groups' performance on the descriptive tests. The data will be considered in the categories the tests are thought to be assessing.

The results of data relevant to intellectual development are presented in Tables III and IV. Means, standard deviations and gain scores for the Stanford-Binet data (mental age and I.Q.), WISC data (Verbal, Performance and Full Scale I.Q.s) and the spatial, conceptualization and sequencing patterns (Bannatyne 1968), are presented in Table III. Similar data for the Piagetian tasks of logico-mathematical concepts are presented in Table IV.

At the beginning of the study the Stanford-Binet mean I.Q.s were within the range commonly referred to as Educable Mentally Retarded. The total Experimental Group mean was somewhat higher (72.4) than the Contrast Group (67.8). Experimental Groups II and III means were similar to each other (74.8 and 73.6, respectively) and to the total group, while Experimental Group I mean (68.8) was similar to the Contrast Group mean.

The total Experimental Group and the Contrast Group WISC Verbal I.Q. means were more similar than Stanford-Binet means (75.0 and 74.3 respectively). Among the Experimental Groups the Group III mean was the highest (78.2) and Group I the lowest (70.9) while the Group II mean (76.0) was similar to the Group III mean. The means for WISC Performance IQ were 78.6 and 74.6 for the total Experimental and Contrast Groups respectively and 73.7, 81.2 and 81.0 for Experimental Groups I, II and III respectively and the same pattern is shown again: Experimental Group I and the Contrast Group are very similar, and Experimental Group I is the lowest of the three Experimental Groups.

The three WISC patterns of subtest scores (spatial, conceptualization and sequencing) indicate that all groups were lowest in sequencing ability, highest in spatial ability while conceptualization ability scores were between these two. The total Experimental and Contrast Groups were similar in conceptualization ability (a mean of 19.7 for both groups) but the total Experimental Group was somewhat higher than the Contrast Group in spatial ability (22.1 vs 20.4) and sequencing ability (17.5 vs 16.6). Experimental Group I had the lowest mean scores in the three areas while Experimental Group II had the highest mean score in spatial ability and Group III the highest mean scores in both conceptualization and sequencing ability.

The gain scores indicated there was no difference between the Stanford-Binet IQ gains made by the total Experimental Group and the Contrast Group (+3.0 and +3.1 respectively). The gains for the three Experimental Groups were +4.4, +1.4 and +3.2. Group I therefore made the greatest gain and Group II the least, the latter making less gain in Stanford-Binet IQ than the Contrast Group.

The results for the WISC followed a different pattern. The Contrast Group mean scores showed either negative change or minimal positive gain. The total Experimental Group on the other hand showed positive gains in all areas

TABLE III

MEANS, STANDARD DEVIATIONS & GAIN SCORES FOR STANFORD-BINET
AND WISC DATA FOR EXPERIMENTAL AND CONTRAST GROUPS ON PRE AND POSTTESTS

Group	N		Stanford-Binet		WISC			WISC Patterns		
			MA	IQ	Verbal IQ	Performance IQ	Full Scale IQ	Spatial	Conceptualization	Sequencing
I Experimental	18	Pre X	79.2	68.8	70.9	73.7	69.6	20.3	17.7	15.4
		S.D.	13.4	6.9	7.0	11.2	8.1	5.5	3.5	4.1
		Post X	87.9	73.2	78.4	80.4	77.2	23.4	22.3	18.4
		S.D.	15.1	7.9	7.7	8.5	7.2	4.1	4.2	3.7
		Gains	+8.7	+4.4	+7.5	+6.7	+7.6	+3.1	+4.6	+3.0
II Experimental	17	Pre X	74.1	74.8	76.0	81.2	76.5	24.1	19.9	17.8
		S.D.	14.1	12.2	9.7	17.3	13.9	8.0	4.8	6.7
		Post X	80.6	76.2	78.6	89.1	81.8	25.9	23.4	21.8
		S.D.	12.3	10.3	14.5	18.3	16.4	8.2	8.7	7.4
		Gains	+6.5	+1.4	+2.6	+7.9	+5.3	+1.8	+3.5	+4.0
III Experimental	18	Pre X	89.1	73.6	78.2	81.0	77.6	22.2	21.4	19.4
		S.D.	22.3	10.2	14.1	16.4	15.8	7.5	7.4	7.1
		Post X	96.9	76.8	79.4	86.8	81.4	25.9	22.8	20.4
		S.D.	22.9	11.6	12.7	13.4	12.4	7.5	6.8	5.9
		Gains	+7.8	+3.2	+1.2	+5.8	+3.8	+3.7	+1.4	+1.0
Total Experimental Group	53	Pre X	80.9	72.4	75.0	78.6	74.5	22.1	19.7	17.5
		S.D.	18.4	10.4	11.2	15.7	13.6	7.3	5.8	6.4
		Post X	88.6	75.4	78.8	85.3	80.1	25.1	22.8	20.2
		S.D.	18.9	10.3	12.0	14.5	12.8	6.9	6.8	6.1
		Gains	+7.7	+3.0	+3.8	+6.7	+5.6	+3.0	+3.1	+2.7
Contrast Group	17	Pre X	75.9	67.8	74.3	74.6	71.7	20.4	19.7	16.6
		S.D.	18.3	8.3	8.3	10.6	10.1	6.0	6.5	4.0
		Post X	82.6	70.9	71.1	75.1	70.2	21.2	17.4	16.8
		S.D.	19.0	10.8	9.3	13.1	11.2	7.2	6.3	4.2
		Gains	+6.7	+3.1	-3.2	+0.5	-1.5	+0.8	-2.3	+0.2

TABLE IV

MEANS, STANDARD DEVIATIONS & GAIN SCORES FOR PIAGETIAN TESTS OF
LOGICO-MATHEMATICAL DEVELOPMENT FOR EXPERIMENTAL AND CONTRAST GROUPS ON PRE AND POST TESTS

Group	N		Classification Tests		Number Tests			
			Multiplication	Inclusion	Conservation of Number	Conservation of Length	Measurement of Length	Seriation
I Experimental	18	Pre X	5.4	4.3	4.9	6.1	2.2	1.9
		S.D.	1.6	2.0	2.2	1.2	1.2	1.0
		Post X	5.7	4.6	5.2	6.0	2.9	3.7
		S.D.	1.6	2.0	2.0	1.4	1.9	1.6
		Gains	+0.3	+0.3	+0.3	-0.1	+0.7	+1.8
II Experimental	17	Pre X	5.1	3.9	3.9	5.9	1.8	2.2
		S.D.	1.6	1.7	2.1	1.0	1.4	1.5
		Post X	5.9	4.5	4.7	6.2	2.7	3.7
		S.D.	1.6	1.9	2.3	1.0	1.7	1.5
		Gains	+0.8	+0.6	+0.8	+0.3	+0.9	+1.5
III Experimental	18	Pre X	5.0	3.4	5.0	6.1	2.8	3.0
		S.D.	1.2	1.7	2.4	1.0	2.2	2.1
		Post X	6.8	5.2	5.3	6.4	3.8	3.6
		S.D.	0.6	1.9	2.1	0.9	2.3	1.8
		Gains	+1.8	+1.8	+0.3	+0.3	+1.0	+0.6
Total Experimental Group	53	Pre X	5.2	3.9	4.6	6.1	2.3	2.4
		S.D.	1.5	1.9	2.3	1.1	1.7	1.7
		Post X	6.1	4.8	5.1	6.2	3.1	3.6
		S.D.	1.4	1.9	2.2	1.1	2.1	1.7
		Gains	+0.9	+0.9	+0.5	+0.1	+0.8	+1.2
Contrast Group	17	Pre X	4.5	4.3	3.5	5.8	1.8	2.8
		S.D.	1.1	2.0	1.7	1.0	1.0	1.2
		Post X	5.1	4.2	3.8	6.3	2.2	2.8
		S.D.	1.3	2.0	1.9	1.0	1.4	1.7
		Gains	+0.6	-0.1	+0.3	+0.5	+0.4	0.0

tested by the WISC with the WISC Verbal mean IQ increasing by +3.8 and the WISC Performance mean IQ by +6.7. The WISC patterns showed a similar trend: the spatial pattern mean gain was +3.0, the conceptualization pattern +3.1 and the sequencing pattern +2.7.

Considering the average gains in WISC Verbal IQ within treatment groups it is clear that Experimental Group I with a mean gain of +7.5 accounted for most of the change among the Experimental Subjects. The average gain in Performance IQ is more similar for the three groups (+6.7, +7.9 and +5.8). It would appear that the greatest change in verbal functioning as measured by the WISC occurred when the subjects were interacting with a relatively large number of adults. The gains in Performance IQ on the other hand occurred regardless of the administrative setting. In the traditional program administered to the Contrast Group where there was lack of interaction in the school setting with any adult figure but the special class teacher, the average Verbal IQ decreased while nonsignificant gains were made in Performance IQ.

The gain scores for the three WISC patterns indicate in which areas the greatest change occurred. The Contrast Group changed sufficiently to maintain the scores on the WISC subtests included in spatial and sequencing ability patterns but showed negative change in conceptualization ability. The total Experimental Group not only maintained but increased their functioning in these three areas (+3.0, +3.1 and +2.7 for the spatial, conceptualization and sequencing patterns respectively). Experimental Group I was the only group to increase consistently in all three areas with the conceptualization scores slightly higher than the other two areas of ability. Group II's increases in conceptualization and sequencing patterns (+3.5 and +4.0) were higher than the increase in the spatial pattern (+1.8). Group III's increase in the spatial pattern was considerably higher than the increases in the conceptualization pattern (+1.4) and the sequencing pattern (+1.0).

The data from the Piagetian tasks are classified as stages of development. The stages of development as described by Piaget are stages 1 and 2 of the preoperational period and stage 3, the stage of concrete operations. The data for the logico-mathematical development tests were quantified by changing the stage to a number in a scale from one (1) to seven (7). Since several of the tests included descriptions of behaviors which can be classified as substages, the new scale included categories for the substages. In the scale used to quantify the data, zero (0) refers to inability to function on the test and presumably implies sensorimotor functioning in that area. The number 1 was substituted for zero; number 2 referred to stage 1A, 3 to 1B, 4 to 2A, 5 to 2B, 6 to 3A and 7 to 3B. When there were no descriptions of behavior for substages, 3 referred to stage 1, 5 to stage 2, and 7 to stage 3.

The results for logico-mathematical tasks are presented in Table IV. In the multiplication of classes test the Experimental Subjects both as a total group and as three treatment groups were very similar at pretest, that is, the mean scores were in the 5.0 to 5.4 range indicating they were in stage 2B of the preoperational period. The Contrast Group mean was slightly lower (4.5) or equivalent to stage 2A. In this task the mean for the Contrast Group changed from stage 2A to 2B while the mean for the Experimental subjects changed

from stage 2B to 3A. Experimental Group I at stage 2B remained at the preoperational level, Group II made slightly higher gains and initiated the stage of concrete operations while Group III with the greatest gain (almost one substage) became concrete operational in this task.

The mean stage at pretest in the inclusion of classes test was at least one substage lower than the mean stage in the multiplication of classes test for all but the Contrast Group. The Contrast Group was at stage 2A on both tests. All groups were functioning at Stage 1B or 2A. This is consistent with a finding in an earlier study by Whyte (1969), that is, that inclusion of classes is generally the last concept in classification in which E.M.R. children become concrete operational and may be one area in classification ability where they fail, as adults, to become concrete operational. The gain scores in the inclusion task followed the same pattern as in the previous task, except that the final stage reached at posttest was lower. The Experimental Subjects changed from stage 2A to 2B with most of the gain contributed by Group III. The Contrast Group changed slightly and in a negative direction.

It would appear from these data that the Stanford-Binet and WISC tests and the two classifications tests are not assessing the same abilities, since in the standardized tests Group I made the greatest amount of gain and in the classification tests the least amount of gain. Exactly the opposite is true for Group III. Chronological age and IQ may be variables contributing to the increase for Group III, since that group had the highest mean C.A., the highest mean WISC Verbal IQ and mean scores comparable to the highest WISC Performance and Stanford-Binet IQs. It should be noted also that a larger proportion of subjects in Group III than in the other groups were taught numbers using the Fletcher Number Program which is based on a Piagetian model. The Fletcher program provides concrete number experiences and stresses social interaction and manipulation of materials but does not attempt to teach conservation directly. There appears to have been transfer of skills from ability to perform in the Fletcher program to ability to perform on the classification tests.

Group I contained more hyperactive children than any other group and consequently more children in Group I received the highly structured Distar Arithmetic program which stresses rote memory of number concepts. Whatever abilities are being taught in Distar, they apparently do not transfer to increase the stage of logical thought, at least in the classification tests administered in this study.

In the conservation of number test Subjects showed very little change. It is difficult to understand why Group III made so little gain in this test, in view of the gains made in classification ability. The same pattern was followed in the conservation of length test but here it can be explained, since many of the subjects were already at stage III at pretest. Apparently children progress in this ability regardless of the type of experience provided. Gain was made by both the Experimental and Contrast Subjects with somewhat more progress made by the former.

In the seriation test operational thinking generally does not appear in children of average intelligence until C.A. 9 years. This ability is therefore one of the last areas of number concepts in which children become concrete

operational. The Experimental Subjects increased by approximately one substage but the Contrast Group did not change. Both groups remained at the preoperational period of development.

In summary, it appears that Stanford-Binet mean IQ increases were the same for both the Experimental and Contrast Subjects; WISC Verbal IQ's showed the greatest increases when prescriptive teaching was combined with a great deal of social interaction with adults while the changes were in a negative direction in children who received traditional programs from one adult; WISC mean Performance IQ's showed similar positive gains for all children in the prescriptive teaching program while the Contrast Group made non-significant positive gains but maintained their rate of growth.

If Bannatyne's groupings (1968) of WISC subtests are valid, the total Experimental Group increased equally in spatial and conceptualization areas and somewhat less in sequencing ability. The Contrast Group made negative or slight positive gains in all areas. The patterns of gains for the three Experimental Groups considered separately do not follow any pattern except that Group I was the only group to increase significantly in all three areas.

The two measures of intellectual functioning, i.e. standardized IQ tests and Piagetian tests of logico-mathematical thinking, do not appear to be measuring the same abilities. The total Experimental Group generally made higher gains in both the standardized tests (except the Stanford-Binet) and the Piagetian tests, however, Group I with the largest gain in Stanford-Binet IQ, WISC Verbal IQ and the WISC conceptualization pattern, made the least gain in the two classification tests. Conversely Group III, although equalling the gain made by the total Experimental Group on the Stanford-Binet IQ, made less gain in the Stanford-Binet than Group I, gained +1.2 IQ points as compared to +7.5 by Group I in the WISC Verbal IQ, made gains in the conceptualization pattern of +1.4 scaled scores compared to +4.6 by Group I but made considerably more gain in four of the Piagetian tasks than did Group I. The gains were particularly different in the two classification tests: +1.8 in both tests for Group III (almost a full stage of gain) and +0.3 in both tests for Group I. These findings, while they may have been influenced by factors mentioned earlier, provided supportive evidence for DeVries work (1973): Stanford-Binet tests and Piagetian tests are assessing different intellectual factors.

The WISC subtest scores were used as diagnostic information to determine patterns of weaknesses and strengths for the Experimental Subjects. The means, standard deviations and gain scores for the scaled scores in the WISC subtests are presented in Table V. Generally the subtests with the lowest scaled scores were Information, Arithmetic, Digit Span and Coding. In order to increase a scaled score in any subtest, the subject must increase the number of correct answers. As the subject becomes chronologically older, generally the raw score results in a lower scaled score. Thus it can be stated generally that if the raw score on the pre and posttest were the same, the scaled score on the posttest would be lower.

TABLE V
MEANS, STANDARD DEVIATIONS & GAIN SCORES FOR WISC SUBTESTS
FOR EXPERIMENTAL GROUPS ON PRE AND POSTTESTS

		WISC Subtests											
Group	N		Information	Comprehension	Arithmetic	Similarities	Vocabulary	Digit Span	Picture Completion	Picture Arrangement	Block Design	Object Assembly	Coding
I Experimental	18	Pre X	5.1	6.4	4.2	6.1	5.1	4.6	6.6	5.4	6.4	7.4	5.4
		S.D.	1.2	1.5	1.8	1.9	1.4	1.1	2.5	2.1	2.5	2.3	2.6
		Post X	5.8	7.1	5.1	8.2	7.0	5.7	6.9	6.9	7.6	8.8	5.9
		S.D.	1.3	1.9	1.6	2.3	1.5	1.3	2.0	1.5	2.4	2.0	2.5
		Gains	+0.7	+0.7	+0.9	+2.1	+1.9	+1.1	+0.3	+1.5	+1.2	+1.4	+0.5
II Experimental	17	Pre X	5.4	5.9	6.5	5	6.6	5.2	7.7	7.1	7.8	8.6	5.4
		S.D.	1.5	2.0	2.5	2.9	1.5	2.1	2.6	3.3	3.4	3.8	2.9
		Post X	5.3	7.5	4.9	9.6	6.3	5.4	8.0	9.2	8.8	9.1	7.0
		S.D.	2.1	3.3	2.5	3.9	2.5	2.5	2.9	3.6	2.6	3.5	3.3
		Gains	-0.1	+1.6	+1.6	+2.1	-0.3	+0.2	+0.3	+2.1	+1.0	+0.5	+1.6
III Experimental	18	Pre X	6.1	7.0	5.9	7.8	6.5	5.7	8.0	7.5	6.8	7.4	6.4
		S.D.	2.5	3.1	2.6	2.6	2.7	2.5	3.2	2.5	3.0	2.9	3.9
		Post X	5.7	6.3	5.7	9.5	7.3	6.0	8.6	7.0	8.2	9.1	7.4
		S.D.	1.6	2.1	2.2	3.2	2.1	2.9	3.1	2.4	2.9	3.7	2.9
		Gains	-0.4	-0.7	-0.2	+1.7	+0.8	+0.3	+0.6	-0.5	+1.4	+1.7	+1.0
Total Experimental Group	53	Pre X	5.5	6.4	5.5	7.1	6.1	5.2	7.4	6.7	7.0	7.8	5.8
		S.D.	1.9	2.4	2.6	2.6	2.1	2.1	2.9	2.8	3.0	3.1	3.3
		Post X	5.6	7.0	5.2	9.1	6.8	5.7	7.8	7.7	8.2	9.0	6.8
		S.D.	1.7	2.5	2.1	3.3	2.2	2.4	2.8	2.9	2.7	3.2	3.0
		Gains	+0.1	+0.6	-0.3	+2.0	+0.7	+0.5	+0.4	+1.0	+1.2	+1.2	+1.0

Only one group, Group I made an increase in scaled score in the Information subtest while Groups II and III showed slight decreases. The Information scores remained well below average. While the average scores for Digit Span and Coding increased for the three groups, the means remained well below the average range.

Two group means (I and II) increased on the Comprehension subtest while Group III decreased and scores remained below the average range. Groups I and III made increases in Vocabulary, the former a fairly substantial gain from 5.1 to 7.0; Group II decreased slightly. The three Experimental Groups made substantial gains in the Similarities subtest, from 1.7 to 2.1 scaled scores, gains which moved the three groups into the average intellectual range.

Means increased in performance subtests for most groups. Coding gains have been discussed. The Picture Completion mean increases were less than one scaled score. The Picture Arrangement means increased substantially for Groups I and II, but decreased slightly for Group III. Block Design means increased between one and two scaled scores for the three groups. The increases in the Block Design test placed the subjects in the three groups in the low normal range. Object Assembly means also showed substantial increases and moved scores into the average range.

According to Glasser and Zimmerman (1967) the Similarities subtest is a moderately good measure of general intelligence (p. 64) while Block Design (p. 83) is an excellent measure of general intelligence (Spearman's G). The three Experimental Groups made substantial progress in both tests, moving each group into the average intellectual range in both instances. Presumably prescriptive teaching has potential for increasing general intellectual ability as measured by the WISC.

According to Glasser and Zimmerman (1967), when Object Assembly and Block Design are paired, they appear to be measuring perceptual organization ability (p. 89). Since the means on both these subtests increased substantially, and moved mean scores into the average intellectual range, it is probably correct to infer that prescriptive teaching has potential for improving perceptual organization ability as measured by the WISC.

Because of the wide range of chronological ages within the three Experimental Groups it was decided to look at the Experimental data by Chronological Age Level (C.A.). Three groups of children were selected: those below 8 years of age, those from 8-1 (eight years one month) to 11-0, and those from 11-1+. There were nineteen children in Group I, twenty-five in Group II and nine in Group III. The means, standard deviations and gain scores for the Stanford-Binet and WISC data are presented in Table VI, while similar data for the Piagetian tasks are presented in Table VII.

At pretest the three C.A. Groups were very similar with the Stanford-Binet mean IQ's of 73.8, 71.1, and 72.8 for Groups I, II and III respectively. The youngest group, Group I, showed the greatest amount of gain in IQ (+4.2) while Groups II and III gained +2.3 and +2.5 IQ points respectively.

At pretest the three C.A. Groups were very similar in WISC Verbal mean IQ (74.7, 75.0, and 75.7) and in WISC Performance mean IQ (78.3, 79.3 and 77.1). Groups I and III made comparable gains in WISC Verbal IQ (+5.6 and +5.0) but Group II made a lesser gain (+2.1). A similar pattern was followed

TABLE VI

MEANS, STANDARD DEVIATIONS & GAIN SCORES FOR STANFORD-BINET
AND WISC DATA FOR THREE CHRONOLOGICAL AGE LEVELS OF EXPERIMENTAL SUBJECTS

C.A. Group	N	Stanford-Binet		WISC		F.S. I.Q.	WISC Patterns			WISC SUBTESTS											
		M.A.	I.Q.	V.I.Q.	P.I.Q.		Sp.	Con.	Seq.	I.	Comp	A.	S.	V.	D.S.	P.C.	P.A.	B.D.	O.A.	Cod.	
<8-0	19	Pre $\bar{X}$	66.2	73.8	74.7	78.3	74.2	22.2	18.7	16.6	5.8	6.5	6.1	6.0	6.3	4.6	7.6	7.0	6.7	7.8	5.2
		S.D.	8.5	10.3	11.8	15.8	14.1	6.9	6.2	6.4	1.9	2.3	2.4	2.3	2.1	3.4	2.4	2.8	3.0	3.6	
		Post $\bar{X}$	74.5	78.0	80.3	86.4	81.4	25.2	23.1	20.8	5.8	7.5	6.0	8.8	6.8	5.7	8.5	7.8	8.2	8.3	7.3
		S.D.	10.6	11.7	13.4	12.9	13.5	6.3	8.1	5.5	2.1	2.6	2.1	4.0	2.4	2.2	3.2	2.6	2.4	2.8	2.8
		Gains	+8.3	+4.2	+5.6	+8.1	+7.2	+3.0	+4.4	+4.2	0.0	+1.1	-0.1	+2.8	+0.5	+1.1	+0.9	+0.8	+1.5	+0.5	+2.1
8-1 to 11-0	25	Pre $\bar{X}$	82.7	71.1	75.0	79.3	74.8	22.3	20.1	18.0	5.3	6.3	5.4	7.7	6.1	5.3	7.1	6.7	7.4	7.9	6.0
		S.D.	13.1	11.2	11.8	16.1	14.1	8.0	5.9	6.3	2.0	2.7	2.8	2.8	2.0	1.8	2.6	3.2	3.2	3.5	2.8
		Post $\bar{X}$	89.6	73.4	77.1	84.9	78.9	25.0	22.2	19.8	5.4	6.7	4.9	9.1	6.4	5.6	7.5	7.8	8.3	9.2	6.4
		S.D.	12.4	9.5	12.0	15.8	13.2	7.5	6.6	6.5	1.6	2.7	2.1	3.2	2.0	2.2	2.6	3.3	2.9	3.4	2.9
		Gains	+6.9	+2.3	+2.1	+5.6	+4.1	+2.7	+2.1	+1.8	+0.1	+0.4	-0.5	+1.4	+0.3	+0.3	+0.4	+1.1	+0.9	+1.3	+0.4
11-1+	9	Pre $\bar{X}$	107.1	72.8	75.7	77.1	74.2	21.6	20.3	18.1	5.6	6.8	4.8	8.1	5.4	5.9	7.9	6.9	6.2	7.4	6.2
		S.D.	13.4	6.7	6.7	13.3	10.0	5.6	3.5	6.0	1.3	1.6	1.6	1.8	1.4	2.2	2.1	2.1	2.4	2.0	3.3
		Post $\bar{X}$	116.0	75.3	80.7	84.3	80.7	25.0	24.2	19.7	5.9	6.8	4.7	9.7	7.8	5.8	7.3	7.2	7.8	9.9	6.7
		S.D.	14.7	6.7	6.5	12.7	8.0	6.1	2.2	5.4	0.7	1.4	1.8	0.8	1.9	2.8	1.9	1.4	2.8	2.8	3.3
		Gains	+8.9	+2.5	+5.0	+7.2	+6.5	+3.4	+3.9	+1.6	+0.3	0.0	-0.1	+1.6	+2.4	-0.1	-0.6	+1.2	+1.6	+2.5	+0.5

TABLE VII

MEANS, STANDARD DEVIATIONS & GAIN SCORES FOR LOGICO-MATHEMATICAL DATA
FOR THREE CHRONOLOGICAL AGE LEVELS OF EXPERIMENTAL SUBJECTS

C.A. Group	N	<i>Piagetian Tasks</i>						
			Multiplication of Classes	Inclusion	Number Conservation	Length Conservation	Measurement of Length	Seriation
<8-0	19	Pre $\bar{X}$	4.8	3.2	2.9	5.3	1.1	1.4
		S.D.	1.4	1.3	1.2	0.7	0.5	1.0
		Post $\bar{X}$	5.4	3.7	3.6	5.4	1.4	2.9
		S.D.	1.8	1.9	1.8	1.0	1.0	1.5
		Gains	+0.6	+0.5	+0.7	+0.1	+0.3	+1.5
8-1 to 11-0	25	Pre $\bar{X}$	5.2	3.8	5.2	6.3	2.4	2.5
		S.D.	1.5	1.9	2.3	1.1	1.4	1.5
		Post $\bar{X}$	6.4	5.0	5.5	6.5	3.5	3.7
		S.D.	1.1	1.7	2.1	1.0	1.7	1.7
		Gains	+1.2	+1.2	+0.3	+0.2	+1.1	+1.2
11-1+	9	Pre $\bar{X}$	6.1	5.7	6.6	7.0	4.3	3.9
		S.D.	1.0	1.6	1.3	0.0	1.9	1.9
		Post $\bar{X}$	6.8	6.3	7.0	7.0	5.7	5.0
		S.D.	0.6	1.3	0.0	0.0	1.3	0.9
		Gains	+0.7	+0.6	+0.4	0.0	+1.4	+1.1

for WISC Performance IQ: Groups I and III gained +8.1 and +7.2 respectively while Group II gained +5.6.

In the WISC patterns Groups I and III made similar and substantial gains in the spatial and conceptualization patterns but in the sequencing pattern only Group I made a significant gain (+4.2).

In the WISC Verbal subtests, the pretest means were within the retarded range and remained so with three exceptions: in the Similarities subtest the three group means increased significantly and moved within the average intellectual range. Thus the subjects in the three C.A. ranges within the three treatment groups presumably increased in general intellectual ability with the greatest gain made by the youngest children. In general, Group I increases for the verbal subtests were slightly higher than increases for Groups II and III with one exception, Vocabulary. This may have been due to the rather surprising interest of Group III to definitions of words when introduced to dictionary skills.

In the performance subtests the mean scaled scores were generally in the 6 to 7 range at pretest. Except for six of the fifteen mean scores, they remained so in spite of increases in raw scores. Only one mean score moved in a negative direction. No pattern can be seen among the three groups since lower increases in one area were balanced by higher increases in another area in each group.

For the logical thinking tasks the usual pattern of increase in stage with increase in C.A. was operating during both pre and posttesting, e.g., in multiplication the pretest means for the three groups were 4.8, 5.2, and 6.1 and the posttest means were 5.4, 6.4, and 6.8. The stage attained in Inclusion of Classes at each C.A. level is somewhat lower than for Multiplication of Classes during both pre and posttesting. In the classification tests the below 8-0 group and the older group made comparable gains while Group II made the greatest increase (+1.2 on both tests).

In conservation of number Group I made the greatest increase, however, a large proportion of subjects in Groups II and III were functioning at the stage of concrete operations at pretest. A score of 7.0 indicates that every member of the group is operational and the mean stages at pretest for Groups I, II and III respectively were 2.9, 5.2 and 6.6. Group I were just beginning to develop counting skills. This explains the seemingly paradoxical finding by treatment group, i.e., that Group III did not make comparable progress in classification and number conservation skills. Treatment Groups I and III contained all of the 11-1+ C.A. Group. Treatment Group III was already close to operational thinking in length and number conservation and therefore little gain could be made.

In length conservation increases for all groups were small but Group II was already close to maximum score at pretest and Group III was completely operational. Measurement of length increased negligibly for Group I, one substage for Group II and almost a complete stage for Group III. All group increases were about equal on the seriation test (from 1 to 1½ substages).

In summary, Group I increases were higher than the increases for Groups II and III in almost every area in the standardized intelligence tests, while Group II showed the lowest increases. It is probably true to generalize that the younger the child the greater is the possibility of displacing the rate of growth in an upwards direction particularly in verbal areas. In the classification tests, however, the 8 to 11 C.A. group made the greatest increases. This was also true for conservation of length and number but in these tasks the older subjects were at, or close to, operational thinking at pretesting. In measurement of length, there was increase in amount of gain with increase in C.A. All groups made substantial and approximately equal gains in seriation but no group exceeded substage 2B or preoperational thought.

CHAPTER VI PERCEPTUAL-MOTOR DEVELOPMENT

Two tests, the Draw-A-Man Test and the Bender Visual-Motor Gestalt Test, were administered as descriptive tests of perceptual-motor development. It was postulated that knowledge acquired about one's own body should transfer to drawings of the human figure. The Draw-A-Man Test was included as a measure of transfer of perceptual-motor skills. The Bender-Gestalt Test was considered a measure of visual-motor integration. Means, standard deviations and gain scores for these data are presented in Table VIII.

The total Experimental Group and the Contrast Group were very similar at pretest in the Draw-A-Man Test and made identical gains. For the Experimental Groups the means at pretest ranged from 68.5 for Group I to 63.1 for Group III. At posttest there was a slight drop in mean score (-2.9) for Group I but positive gains were made by Group II (+8.8) and Group III (+9.3).

The largest number of hyperactive children were found in Group I. Their programs were highly structured. For this group remediation of motor areas was for the most part carried out by implementing a Chaney-Kephart type program for splintered motor skills. A gymnastics program in which motor skills were taught in a games' program was administered to Group I as a regular physical education program. In spite of the concentrated nature of the motor program, the group as a whole made slight negative changes in the Draw-A-Man Test. Groups II and III, while including several hyperactive children, did not include as high a proportion as Group I. The remediation programs for these two groups were about evenly divided between developmental-type programs such as Frostig Move-Grow-Learn and Cratty Developmental Sequences for children with overall types of motor problems, and the Chaney-Kephart program for children with splintered motor skills. The Contrast Group with no specific program also made gains but somewhat less than Groups II and III.

The functioning in the Bender Gestalt test was slightly better at pretest for the total Experimental Group than for the Contrast Group. Experimental Groups I and III were comparable in mean scores (69.6 and 69.4) but Group II was considerably lower (60.2). Group II children were also considerably younger than the other two groups.

The mean scores for both the total Experimental Group and the Contrast Group changed in a negative direction (-5.0 and -3.4). Group I was the only group to change in a positive direction (+5.4). As mentioned previously, the majority of children in Group I were in highly structured programs. It is possible that structure is the key variable in improving functioning in the skills thought to be measured by the Bender Gestalt test.

The Bender Visual Motor Gestalt Test "purports to estimate visual-motor development of the child; such development is seen as parallel to mental development and as associated with language ability" (Bender, 1938; cited by Myers and Hammill, 1969, p. 58). It is difficult to explain the negative changes which resulted in performance in this test. In view of what Bender has said

TABLE VIII

MEANS, STANDARD DEVIATIONS, GAIN SCORES FOR PERCEPTUAL-MOTOR DATA
FOR EXPERIMENTAL & CONTRAST GROUPS ON PRETEST & POSTTEST

Group	N		Tests	
			Draw-A-Man	Bender Gestalt
I Experimental	18	Pre $\bar{X}$	68.5	64.2
		S.D.	6.5	21.6
		Post $\bar{X}$	65.6	69.6
		S.D.	8.0	14.5
		Gains	-2.9	+5.4
II Experimental	17	Pre $\bar{X}$	66.3	75.0
		S.D.	10.9	21.9
		Post $\bar{X}$	75.1	60.2
		S.D.	11.1	23.0
		Gains	+8.8	-14.8
III Experimental	18	Pre $\bar{X}$	63.1	75.4
		S.D.	16.8	26.4
		Post $\bar{X}$	72.4	69.4
		S.D.	9.8	25.7
		Gains	+9.3	-6.0
Total Experimental Group	53	Pre $\bar{X}$	65.9	71.5
		S.D.	12.5	24.2
		Post $\bar{X}$	71.0	66.5
		S.D.	10.6	22.2
		Gains	+5.1	-5.0
Contrast Group	17	Pre $\bar{X}$	65.1	67.3
		S.D.	5.0	20.1
		Post $\bar{X}$	70.2	63.9
		S.D.	8.7	12.8
		Gains	+5.1	-3.4

concerning its association with language, visual-motor and mental development further attempts at interpretation will be withheld until the former two categories of diagnostic results are presented.

In summary, it would appear that perceptual-motor development as measured by the Draw-A-Man test is much more amenable to change than those aspects of perceptual-motor development measured by the Bender Gestalt test, since scores increased for both Experimental and Contrast subjects in the former but decreased for both groups in the latter.

Four tests were administered to the Experimental subjects to diagnose deficits and strengths in perceptual-motor skills in order to program for perceptual-motor functioning. The Purdue Perceptual-Motor Survey was administered to assess motor and perceptual-motor abilities. The Harris Test of Lateral Dominance was administered to assess whether dominance had emerged and whether dominance was coordinated or mixed. Two of the Piagetian space tests as described by Laurendeau and Pinard (1970) were used to assess the child's ability to understand the concept of opposition of left and right and his ability to coordinate left and right and top and bottom when copying from a model. The Frostig Developmental Test of Visual Perception purports to measure five components of visual perception and was administered to assess visual perception. Means, standard deviations and gain scores for these four tests are presented in Table IX.

A. The Purdue Perceptual-Motor Survey

The Purdue is not a standardized test in that norms for various age levels are not available. The authors do say that the abilities being tested should be established by six to eight years of age in "normal" children. Twenty-two aspects of perceptual-motor performance are grouped together in five areas: Balance and Posture (B. & P.), Body Image and Differentiation (B.I.), Perceptual-Motor Match (P.M.M.), Ocular Control (O.C.) and Form Perception (F.P.). Each of the twenty-two skills is ranked on a scale of 1 to 4 with 4 the high score. To quantify the data for analysis, the scores in each of the five areas were averaged to obtain a total perceptual-motor score. The new scale ranged from one to seven (1-7) to account for part scores: an average score of 1 on the new scale yielded a score of 1; an average of 1 to 2 yielded a score of 2; 2 yielded 3; 2 to 3 yielded 4; 3 yielded 5; 3 to 4 became 6 and 4 became 7.

The three Experimental Groups were below the top score of 7 in all areas at pretest. Form Perception and Perceptual-Motor Match had the lowest means for all groups. Both of these areas deal with copying from a model or drawing (e.g., a circle) from verbal instructions.

Group I was the only group to improve in the five areas on the Purdue while Group II showed negative change in four areas and Group III made significant improvement in only one area, Form Perception, the only area in which consistent improvement was made by the three groups. No group attained a top score in any area.

A brief explanation of the program may help to clarify the differences. Children with "splintered skills" were administered a Chaney-Kephart type

TABLE IX

MEANS, STANDARD DEVIATIONS & GAIN SCORES FOR PERCEPTUAL-MOTOR TESTS FOR
EXPERIMENTAL GROUPS ON PRE AND POSTTESTS

Group	N		Purdue					Harris Test of Lateral Dominance				Frostig					Piagetian Space Tests	
			B.A.P.	B.I.	P.M.M.	O.C.	F.P.	$\bar{X}$ of all Tests	Eye- Motor	Figure- Ground	Form Constancy	Position in Space	Spatial Relations	Topo- graphical	Left- Right			
I Experimental	18	Pre $\bar{X}$	4.8	4.7	4.7	4.2	3.5	4.4	1.2	4.7	4.7	78.8	68.8	77.0	76.7	77.3	4.8	2.3
		S.D.	1.2	1.2	1.1	1.6	1.7	0.8	0.4	1.9	1.8	19.3	15.5	19.5	12.9	14.9	0.8	1.5
		Post $\bar{X}$	5.7	5.9	5.2	5.8	5.1	5.5	1.5	6.4	5.8	103.5	78.5	92.0	87.7	88.2	5.1	3.1
		S.D.	1.7	0.8	1.0	1.3	1.3	0.8	0.5	1.6	1.2	20.2	16.6	18.9	16.1	14.0	1.0	1.2
		Gains	+0.9	+1.2	+0.5	+1.6	+1.6	+1.1	+0.3	+1.7	+1.1	+24.7	+9.7	+15.0	+11.0	+10.9	+0.3	+0.8
II Experimental	19	Pre $\bar{X}$	5.3	5.0	4.3	5.2	3.5	4.7	1.6	6.0	5.9	69.7	67.9	76.8	74.5	81.0	4.8	2.8
		S.D.	1.2	0.6	1.0	1.4	1.3	0.9	0.5	2.6	1.7	13.6	17.2	22.6	18.7	17.9	1.4	1.2
		Post $\bar{X}$	4.7	4.5	3.8	4.8	4.6	4.5	1.5	6.0	6.1	87.2	85.2	99.7	84.4	90.9	5.1	2.9
		S.D.	1.3	1.3	1.3	1.7	1.8	1.1	0.5	2.2	1.0	19.5	18.1	12.8	18.0	13.1	1.4	0.7
		Gains	-0.6	-0.5	-0.5	-0.4	+1.1	-0.2	-0.1	0.0	+0.2	+17.5	+17.3	+22.9	+9.9	+9.9	+0.3	+0.1
III Experimental	18	Pre $\bar{X}$	5.3	4.8	4.6	5.7	4.2	4.9	1.4	6.1	5.6	94.6	81.0	81.5	82.3	83.7	5.5	3.7
		S.D.	1.6	1.4	1.9	1.2	2.1	1.4	0.5	2.0	1.9	26.6	22.5	16.7	16.1	16.9	1.3	1.5
		Post $\bar{X}$	4.9	4.9	4.8	4.9	5.3	5.0	1.6	6.9	6.2	101.8	83.0	90.7	89.0	90.0	5.7	4.6
		S.D.	1.7	2.0	1.6	1.8	1.3	1.5	0.5	1.3	1.0	21.4	16.5	14.0	16.9	11.1	1.5	1.8
		Gains	-0.4	+0.1	+0.2	-0.8	+1.1	+0.1	+0.2	+0.8	+0.6	+17.2	+2.0	+9.2	+6.7	+6.3	+0.2	+0.9
Total Experimental Group	53	Pre $\bar{X}$	5.1	4.8	4.5	5.0	3.7	4.7	1.4	5.6	5.4	81.3	72.7	78.5	77.9	80.7	5.0	3.2
		S.D.	1.4	1.1	1.4	1.6	1.8	1.1	0.5	2.3	1.9	23.3	19.8	20.0	16.5	17.0	1.2	1.5
		Post $\bar{X}$	5.1	5.1	4.6	5.2	5.0	5.0	1.5	6.4	6.0	97.7	82.2	94.0	87.1	89.7	5.3	3.5
		S.D.	1.6	1.6	1.5	1.7	1.5	1.3	0.5	1.8	1.1	21.9	17.4	16.1	17.3	12.9	1.4	1.5
		Gains	0.0	+0.3	+0.1	+0.2	+1.3	+0.3	+0.1	+0.8	+0.6	+16.4	+9.5	+15.5	+9.2	+9.0	+0.3	+0.3

program geared to deficits. Children with an overall homogeneous profile were administered a developmental program, e.g. Cratty's program. This rule was followed for the three groups, however, the male students who worked with Group I gave the children in that group an intensive program in gymnastics paying particular attention to areas of deficit. Since Group I made the highest mean gains in all areas, it would appear that the gymnastics program made the difference. The other programs, while thorough and well sequenced, were considered "work" by the children. The gymnastics program was considered a "play" period. It is possible, therefore, that motor programs should be built around a "play" theme while still working on deficit areas and that motivation is an important, if not the essential component in improving perceptual-motor development as measured by the Purdue Perceptual-Motor Survey.

B. Lateral Dominance

The Harris Test of Lateral Dominance is purported to measure knowledge of left and right and eye, hand and foot dominance. To quantify the data for this test three questions were asked: (1) whether dominance is established (score of 2) or is not established (score of 1); (2) extent of dominance established; (3) significance of where dominance is not established. The first column in Table IX under Harris Test of Lateral Dominance deals with question (1), the second column with question (2) and the third with question (3).

For questions (2) and (3) arbitrary decisions had to be made and two scales were constructed. For question (2), extent of dominance established, a scale from 1 to 7 was based on the hypothesis that the steps are in order of difficulty and possibly of development. The hypothesized steps are:

1. eye, hand and foot: mixed dominance;
2. dominance is established in one of the three but there is mixed dominance in the remaining two;
3. dominance is established in two areas but different (left and right) and mixed in the third;
4. dominance is established in two areas and is the same but the third is mixed;
5. dominance is established in three areas and is the same in two but opposite in the third;
6. left dominance is established in three areas;
7. right dominance is established in three areas.

Steps 6 and 7 do not imply that a left dominant child becomes right dominant but rather that a left dominant child is at slightly more of a disadvantage than a right dominant child.

For question (3) a second scale was constructed but from 1 to 8. Again the steps are hypothesized to be in the order of difficulty they present to the child with 1 indicating the greatest amount of difficulty. They are:

1. eye, hand, foot have different dominance;
2. eye and hand dominance are different but foot is the same dominance as one of the others;
3. hand and foot dominance are different but eye dominance is the same as one of the others;
4. eye and foot dominance are different but hand dominance is the same as one of the others;
5. hand dominance is different from eye and foot dominance;
6. eye dominance is different from hand and foot dominance;
7. foot dominance is different from eye and hand dominance;
8. eye, hand and foot dominance are the same.

From the mean scores in Table IX it can be seen that dominance was not established in the majority of cases in Group I (mean = 1.2), but was established in about half the cases in Groups II and III (1.6, and 1.4). Groups I and III showed slight positive change and Group II slight negative change. If the hypotheses in questions (2) and (3) are valid, then subjects in Groups I and III moved closer to establishing dominance (from 4.7 to 6.4, and 6.1 to 6.9) and Group II showed no change (6.0). In question (3) scores increased for all groups again indicating children made progress in establishing dominance.

C. Representational Space

Two of the Piagetian tests of representational space were administered: the Concept of Opposition of Left-Right test and the Localization of Topographical Positions test. According to Piaget understanding the concept of opposition of left and right develops in three stages: in stage I the child understands the concept in relation to his own body; in stage II he understands the concept in relation to a person standing opposite him; in stage III he understands the relative nature of the concept, that is, that an object can be both left and right depending on its position in a group of objects. According to Laurendeau and Pinard (1970), stages I, II, and III emerge at approximately 8, 10, and 12 years respectively. For both these tests the method used for quantifying the data was the same as for the logical thinking tests: unable to function on the test or stage 0 = 1, stage 1A = 2, 1B = 3, 2A = 4, 2B = 5, 3A = 6, 3B = 7.

The data show that no group was operational on this test either at pre or posttest. The means for Groups I and III increased slightly but for Group II there was essentially no change. These data will be more easily understood when considered in the C.A. comparisons.

To assess the understanding of Localization of Topographical Positions the child and the Examiner sat with two identical "towns" facing them (a rectangular board with a road and railroad and houses placed in various positions). First the child was asked to move a little man into the same positions as the Examiner moved a little man. Then the child's board was

rotated 180 degrees and the procedure was repeated. The little man was moved from left to right and top to bottom positions on the board. According to Piaget, and Laurendeau and Pinard (1970), the child first learns to coordinate left-right (stage 2A) and then top-bottom (stage 2B) while the position of the boards is identical. The same sequence of development is followed when the child's board is rotated: left-right (stage 3A) and top-bottom (stage 3B). These stages are reached at somewhat earlier ages than in the previous test. The increases in stage of development for this task for the groups were very slight. It would appear, therefore, that prescriptive teaching as interpreted in this study has no effect in increasing understanding of representational space, however, the analysis by C.A. may shed more understanding of what occurred in these two areas.

D. The Frostig Developmental Test of Visual Perception

The Frostig test consists of five subtests: (1) Eye-Motor Coordination, (2) Figure-Ground, (3) Form Constancy, (4) Position in Space, and (5) Spatial Relations. There are different upper limits for each test: 10+ or 120+ months for test (1), 8-3 or 99 months for test (2), 9-0 or 108 months for test (3), 8-9 or 105 months for test (4), and 8-3 or 99 months for test (5). The data are presented in months. The three groups made positive gains in all tests and most gains were substantial.

Group I made the greatest amount of gain in three of the subtests, Eye-Motor Coordination, Position in Space and Spatial Relations. Group III made the least amount of gain in all five subtests. Group II with the lowest mean C.A., made higher gains in four of the subtests than Group III and a comparable gain in the fifth. No group attained the top score in the Spatial Relations subtest. For the remaining tests the groups approximated each other in distance from the top possible score.

In summary, motor scores increased although gains were not sufficient to bring the functioning of these children up to expected levels for "normal" eight-year-olds. The greatest gains occurred when remediation programs were accompanied by a highly motivating program geared to correcting deficits. Dominance as assessed by the Harris Test of Lateral Dominance was increased, presumably because of the motor training. If the Frostig Test measures the components it purports to measure, then visual perception improved substantially for all groups. Finally, increases in the representational space tests were slight. Training of perceptual-motor skills appears to have transferred to increase several areas of perceptual-motor development but not performance in the representational space tests. The abilities assessed by the latter tests do not appear to be subject to displacement of rate of development through the prescriptive teaching program used in this study.

The data for the tests of perceptual-motor development were analyzed for the three C.A. groups described earlier. The results are presented in Table X.

In the Purdue Test with very few exceptions each group increased both in individual sub areas and in total score as C.A. increased. Group III made the greatest amount of gain in all areas except Balance and Posture and Form Perception, and were close to the top score of 7. Groups I and II appeared to

TABLE X

MEANS, STANDARD DEVIATIONS & GAIN SCORES FOR PERCEPTUAL-MOTOR
PRE & POSTTEST DATA FOR THREE CHRONOLOGICAL AGE LEVELS OF
THE EXPERIMENTAL SUBJECTS

CA Group	N		Purdue Perceptual Motor Survey						Draw-A-Man	Bender Gestalt	Harris Test of Lateral Dominance			Frostig Developmental Test of Visual Perception					Piagetian Space Tests	
			B & P	B.I.	P.M.M.	O.C.	F.P.	Total			E.M.	F.G.	F.C.	P.in S.	S.R.	Topo-graphical	Left-Right			
<8-0	19	Pre X	5.0	4.6	3.8	4.5	3.1	4.2	67.8	79.9	1.3	5.0	5.2	66.8	57.8	69.5	69.6	71.5	4.4	2.5
		S.D.	1.3	0.9	1.3	1.3	1.2	0.9	8.6	16.2	0.5	2.6	1.8	12.1	13.4	11.8	14.8	18.4	0.9	0.9
		Post X	4.4	4.2	4.1	4.8	4.7	4.4	71.7	71.4	1.3	5.8	5.6	85.4	72.3	87.0	81.3	84.4	4.3	2.7
		S.D.	1.8	1.6	1.2	1.4	1.5	1.1	10.4	20.0	0.4	1.7	0.9	23.0	18.0	17.2	16.0	13.1	0.9	0.4
		Gains	-0.6	-0.4	+0.3	+0.3	+1.6	+0.2	+3.9	-8.5	0.0	+0.8	+0.4	+18.6	+14.5	+17.5	+11.7	+12.9	-0.1	+0.2
8-1 to 11-0	25	Pre X	5.2	4.9	4.5	5.0	3.6	4.6	64.5	63.4	1.5	6.2	6.0	84.2	78.4	78.1	79.6	84.1	5.2	3.3
		S.D.	1.2	1.0	1.1	1.7	1.7	1.0	15.5	3.7	0.5	2.0	1.2	21.7	18.0	21.6	14.8	13.5	1.2	1.3
		Post X	5.4	5.3	4.4	5.0	4.9	5.0	71.7	60.9	1.7	6.8	6.5	101.0	86.3	97.9	88.8	91.8	5.7	3.4
		S.D.	1.2	1.4	1.3	1.9	1.5	1.2	10.6	22.5	0.4	1.8	0.9	17.2	14.6	12.9	17.8	12.5	1.3	1.3
		Gains	+0.2	+0.4	-0.1	0.0	+1.3	+0.4	+7.2	-2.5	+0.2	+0.6	+0.5	+16.8	+7.9	+19.8	+9.2	+7.7	+0.5	+0.1
11-1+	9	Pre X	5.3	5.1	5.9	6.2	5.4	5.6	66.0	76.0	1.3	5.3	4.1	103.7	88.3	98.3	90.3	90.3	5.7	4.6
		S.D.	1.8	1.7	1.4	1.0	1.8	1.4	8.4	13.7	0.5	2.1	2.6	23.1	13.4	12.6	14.2	12.0	1.3	1.8
		Post X	5.8	6.4	6.2	6.4	5.9	6.2	67.2	71.9	1.4	6.6	5.7	14.3	91.7	98.0	94.4	95.0	6.2	5.4
		S.D.	1.8	0.7	1.0	1.0	1.1	0.8	9.4	20.8	0.5	1.3	1.2	14.0	11.8	16.0	13.3	8.6	0.9	1.8
		Gains	+0.5	+1.3	+0.3	+0.2	+0.5	+0.6	+1.2	-4.1	+0.1	+1.3	+1.6	+10.6	+3.3	-0.3	+4.1	+4.7	+0.5	+0.8

be most impaired in Form Perception and made their greatest gain in this area. Group III made their greatest gain in Body Image and were the only group to show gain in all areas.

The number of children to establish lateral dominance did not increase to any great extent and in fact the number of children who did establish dominance in the three groups was very similar in spite of the age differences. Using the scales described previously, there was a significant increase in the numbers in each group who increased in extent of dominance with Groups II and III approaching the top of the scale. With reference to the significance of where dominance was established, Groups I, II and III increased substantially, however, Group III remained very similar to Group I. Indeed, Group III was almost one scale point below Group I at pretesting.

Results for the two representational tests indicated subjects followed the usual pattern of development, that is, the mean stage was higher for each C.A. group. In the Localization of Topographical Positions test subjects in each C.A. group made little progress towards operational thinking. Few subjects attained the stage of development expected for their C.A. level and prescriptive teaching did not appear to accelerate the rate of development. Similar results were found for the concept of left and right test.

In general, the same pattern was found for each of the Frostig subtests: Group I increased substantially, Group II made considerable gains but Group III made minor gains; although Group III subjects were considerably closer to maximum possible score at pretest, they did not attain maximum score at posttest.

The two descriptive tests were also analyzed for each chronological age group. The Draw-A-Man test showed gains for each group. It was hypothesized that performance in the Draw-A-Man test would increase with increased knowledge of Body Image, yet Group I decreased in the mean score in the Body Image subtest in the Purdue and increased in the mean score in the Draw-A-Man test. Group II made a slight increase in mean score on the Body Image subtest and only increased +1.2 IQ points on the Draw-A-Man test.

The Bender Visual-Motor Gestalt Test is purported to assess visual-motor development and this development is thought to parallel mental development and to be associated with language ability. However, in spite of the fact that each group increased in mental development as measured by IQ, in Visual-Motor development as measured by the Purdue and Frostig Tests, and in language ability as measured by the Wepman and ITPA, the three groups *decreased* in mean score on the Bender-Gestalt. Group I decreased from 79.9 to 71.4, a loss of 8.5 points, Group II from 63.4 to 60.9, a loss of 2.5 points, and Group III from 76.0 to 71.9, a loss of 4.1 points. It is difficult to explain these losses. The losses occurred in analysis both by C.A. and treatment Group. Further study is necessary to determine why.

CHAPTER VII LANGUAGE DEVELOPMENT

The tests administered to assess language development were part of the diagnostic battery and were administered therefore to the Experimental but not the Contrast subjects. The tests administered were the Peabody Picture Vocabulary Test (PPVT), Illinois Test of Psycholinguistic Abilities (ITPA), and Wepman Test of Auditory Discrimination. The means, standard deviations and gain scores for these data are presented in Table XI.

A. The Peabody Picture Vocabulary Test

The PPVT is sometimes considered an IQ test. In this study the PPVT was administered primarily as a test of receptive vocabulary. The PPVT results are reported as two scores, mental age and IQ. The M.A. increased for three groups, however, in only two groups was the increase large enough to raise IQ, and increases were minimal. Although all remedial programs employed in the study were intended to increase vocabulary, at least as a secondary aim, receptive vocabulary development as measured by the PPVT did not change significantly.

B. Wepman Test of Auditory Discrimination

In the Wepman Test of Auditory Discrimination the Examiner presents pairs of words to the child while the child sits with his back facing the Examiner. There are two types of word pairs, words that are the same and words that are different. Mistakes in the former are called Y errors and in the latter X errors. If a child makes an X error score of more than 15 or a Y error score of more than 3, the test is judged invalid. Therefore, two types of scores are presented, the X errors and the Y errors and the number of invalid tests.

The three Experimental Groups improved significantly in auditory discrimination. In addition to the improvement in auditory discrimination the number of invalid tests was reduced from 17 to 7. The most common reasons for the initial tests being invalid were severe hearing loss and immaturity of subjects. The latter did not comprehend the concepts same and different. The seven invalid tests at posttest were for children with severe hearing loss (2) and children in the TMR range [there were five (5) children in the study with Down's Syndrome].

The Thurstone Learning to Think Series probably contributed most significantly to decreasing the number of invalid tests. These types of exercises were used extensively with children who did not understand the concept of same and different. The program most often used for auditory discrimination per se was Sound-Order-Sense.

C. The Illinois Test of Psycholinguistic Abilities

In the Illinois Test of Psycholinguistic Abilities (ITPA) there was only one negative change. Results are presented as Language Age (in months) for the twelve subtests and the Average Language Age (PLA). Group II made the greatest amount of gain in seven of the twelve subtests and the average

TABLE XI

MEANS, STANDARD DEVIATIONS & GAIN SCORES FOR LANGUAGE DATA
FOR EXPERIMENTAL GROUPS ON PRE AND POSTTEST

		PPVT		WEPMAN				ITPA												
Group	N	MA	IQ	X Errors	Y Errors	Validity	PLA	Grammatical Closure	Auditory Closure	Sound Blending	Visual Closure	Auditory Memory	Visual Memory	Auditory Reception	Visual Reception	Auditory Vocal Assoc.	Visual Motor Assoc.	Vocal Expression	Motor Expression	
I Experimental	18	Pre X	88.2	81.9	11.7	1.1	7	77.9	75.2	69.1	84.4	85.4	57.0	74.6	77.2	76.6	75.1	79.9	80.0	94.8
		S.D.	17.3	9.4	9.6	2.4		12.2	14.6	21.3	25.2	19.5	16.4	15.9	26.5	13.4	16.6	15.8	17.5	23.4
		Post X	94.3	82.3	6.1	1.3	2	84.6	78.1	73.8	93.4	90.6	63.9	80.2	90.2	85.9	84.8	84.8	90.7	101.2
		S.D.	18.7	7.8	6.7	2.5		13.9	15.8	21.2	19.8	18.6	24.0	21.7	20.9	15.0	15.1	20.1	19.2	21.7
		Gains	+6.1	+0.4	+5.6	-0.2	5	+6.7	+2.9	+4.7	+9.0	+5.2	+6.9	+5.6	+13.0	+9.3	+9.7	+4.9	+10.7	+6.4
II Experimental	17	Pre X	76.0	82.4	14.0	2.8	6	67.8	63.7	57.1	75.0	70.7	60.5	62.6	63.1	75.4	67.7	73.4	69.8	70.4
		S.D.	17.9	15.9	11.0	4.1		11.0	15.9	16.3	17.7	17.4	16.2	14.1	12.0	20.2	14.5	17.3	14.6	20.3
		Post X	86.1	85.7	5.9	0.7	1	78.2	77.0	68.6	90.9	83.3	62.6	78.8	78.1	81.0	77.1	82.9	71.4	91.7
		S.D.	14.5	12.0	3.6	1.6		13.3	15.7	17.5	21.9	17.5	16.8	13.3	22.8	23.1	16.2	18.2	13.6	18.6
		Gains	+10.0	+3.3	+8.1	+2.1	5	+10.4	+13.3	+11.5	+15.9	+12.6	+2.1	+16.2	+15.0	+5.6	+9.4	+9.5	+1.6	+21.3
III Experimental	18	Pre X	97.3	84.7	6.4	1.6	4	81.5	78.3	75.7	89.2	86.8	74.9	79.9	84.2	90.3	84.4	92.9	78.8	92.8
		S.D.	29.4	15.1	5.3	2.6		29.1	25.2	28.7	37.1	29.5	28.1	27.4	29.5	25.6	24.5	22.7	26.2	28.5
		Post X	101.7	83.5	3.9	1.1	4	85.8	85.1	90.7	91.6	93.7	78.2	89.4	81.1	97.9	84.9	93.7	79.7	96.6
		S.D.	25.7	12.8	2.6	2.5		21.1	22.4	25.0	20.9	28.7	27.1	26.4	25.1	25.7	22.4	26.6	16.8	19.1
		Gains	+4.4	-1.2	+2.5	+0.5	0	+4.3	+6.8	+15.0	+2.4	+6.9	+3.3	+9.5	-3.1	+7.6	+0.5	+0.8	+0.9	+3.8
Total Experimental Group	53	Pre X	87.4	83.0	10.7	1.8	17	75.9	72.5	67.5	83.0	81.2	64.2	72.5	75.1	80.8	75.9	82.2	76.3	86.3
		S.D.	24.1	13.9	9.6	3.2		20.4	20.4	24.3	28.9	24.2	22.7	21.6	25.9	21.7	20.5	20.7	20.8	27.0
		Post X	94.2	83.8	5.3	1.0	7	82.9	80.1	77.8	92.0	89.3	68.3	82.9	83.2	88.4	82.4	87.2	80.8	96.6
		S.D.	21.4	11.3	4.8	2.3		17.0	18.8	23.7	21.1	22.9	24.5	22.0	23.8	23.1	18.7	22.7	18.7	20.4
		Gains	+6.8	+0.8	+5.4	+0.8	10	+7.0	+7.6	+10.3	+9.0	+8.1	+4.1	+10.4	+8.1	+7.6	+6.5	+5.0	+4.5	+10.3

language age. Group III made the least amount of gain in seven of the twelve subtests and the average language age. For the total Experimental Group, Auditory Memory and Vocal Expression showed the least amount of gain with Group I contributing the greatest amount of increase. Auditory Closure, Visual Memory and Auditory Reception appear to be most amenable to change, with 10 or more months of increase for two of the three groups. In summary, it can be stated that scores on the ITPA can be increased. In this study 17 of a possible 39 mean scores increased more than 7 months which is the period of time the children were instructed.

Remediation of psycholinguistic abilities need not be geared to the individual tests. In general the principle followed in remediating language was to use the psycholinguistic model to remediate individual areas for children with "splintered" language skills, that is, high and low scores with no discernible pattern. For children whose profile on the ITPA was relatively homogeneous and/or manifested a particular pattern of deficits and strengths, an overall language program, developmental in nature, was administered. The majority of the children in Group II fell in the latter category and programs such as Peabody Language Development and the Rebus were used. The Rebus was utilized primarily for vocabulary development and vocal expression. As stated earlier, Group II made the greatest amount of gain.

The majority of the younger children in Group III were very low in all language skills and also required a structured program because of their activity level. The program for these children consisted mainly of Distar Language. Group III showed the least amount of gain. The oldest children in Group III were also relatively homogeneous in language skills and the Mott Language Program was used.

The language data were also analyzed by C.A. groups. The results are presented in Table XII. Groups I and II made minimal positive gains in PPVT IQ, while Group III decreased slightly. In the Wepman, Groups I and II decreased both in the number of errors and invalid tests. Group III showed little change since their performance at pretest was close to maximum.

As one would expect, the average language score (PLA) on the ITPA increased as the mean C.A. for each group increased. The PLA mean gain was slightly larger for Group I than for Groups II and III and was greater than seven months. Average gains for Groups II and III were slightly less than seven months. For Group I Auditory Memory and Visual Motor Association were the only two subtests where scores did not change significantly, however, the mean language age in nine of the remaining ten subtests increased more than seven months. For Group II the mean language age increased more than seven months in seven of the twelve subtests. For Group III the mean language age increased more than seven months in only four of the subtests and decreased in three areas. The greatest gain for Group I was in Sound Blending (+23.2) but substantial gains were also made in Auditory Closure (+10.3), Visual Memory(+13.6), Auditory-Vocal Association (+12.0) and Motor Expression (+13.5). Group II also made substantial gains in Auditory Closure (+11.9), Visual Memory (+10.6) and Motor Expression (+12.6). Only two notable gains were made by Group III: Auditory Memory (+18.8), Visual Reception (+9.6) and Visual Motor Association (+15.8).

TABLE XII

MEANS, STANDARD DEVIATIONS & GAIN SCORES FOR LANGUAGE DATA FOR
THREE CHRONOLOGICAL AGE LEVELS OF EXPERIMENTAL SUBJECTS

Group	N	PPVT		WEPMAN			ITPA													
		M.A.	I.Q.	X Errors	Y Errors	Validity	PLA	G.CI	A.CI	S.B.	V.CI 25.8%	Vis. Mem.	Aud. Mem.	Vis. Rec.	Aud. Rec.	AVA	VMA	Voc. Exp.	Motor Exp.	
<8-0	19	Pre $\bar{X}$	70.0	84.6	15.2	3.1	10	62.8	60.0	51.9	63.8	67.6	53.7	60.9	55.2	69.5	59.3	70.8	62.5	70.5
		S.D.	13.9	15.8	11.3	4.2		10.6	15.1	17.9	20.4	14.0	15.4	15.5	9.8	19.4	10.4	17.5	12.1	20.9
		Post $\bar{X}$	78.7	87.0	8.0	1.7	6	71.4	68.0	62.2	87.0	76.8	54.4	74.5	67.1	76.1	71.3	71.6	70.4	84.0
		S.D.	10.1	11.3	6.6	2.7		11.9	12.0	16.7	21.5	19.6	13.7	14.3	17.0	20.1	12.7	15.7	15.1	20.2
		Gains	+8.7	+2.4	+7.2	+1.4	4	+8.6	+8.0	+10.3	+23.2	+9.2	+0.7	+13.6	+11.9	+6.6	+12.0	+0.8	+7.9	+13.5
8-0 to 11-0	25	Pre $\bar{X}$	88.4	81.8	10.2	1.4	4	77.2	73.0	67.5	87.0	83.2	66.6	74.0	77.6	82.8	78.4	85.0	80.2	89.6
		S.D.	16.2	13.4	7.1	2.4		20.1	15.3	18.0	22.6	23.2	23.5	18.1	21.8	16.5	15.8	19.4	20.8	26.5
		Post $\bar{X}$	95.8	82.2	4.1	0.9	0	83.5	81.0	79.4	91.8	90.7	71.6	84.6	87.6	90.4	81.2	89.4	81.4	102.2
		S.D.	18.1	11.9	2.5	2.1		13.1	15.3	19.0	22.6	18.7	23.8	23.8	22.2	20.3	14.1	18.5	17.2	16.3
		Gains	+7.4	+0.4	+6.1	+0.5	4	+6.3	+8.0	+11.9	+4.8	+7.5	+5.0	+10.6	+10.0	+7.6	+2.8	+4.4	1.2	+12.6
11-1+	9	Pre $\bar{X}$	121.4	82.9	2.4	0.2	2	99.8	100.1	100.3	112.6	104.2	79.8	93.0	110.0	99.4	104.0	98.3	94.8	110.4
		S.D.	21.0	9.2	2.3	0.4		10.8	11.1	15.3	28.8	23.4	21.2	23.6	16.4	23.2	10.7	15.2	14.7	13.6
		Post $\bar{X}$	122.4	81.7	2.9	0.0	0	105.9	103.3	106.8	103.0	111.9	88.6	95.7	105.1	109.0	108.8	114.1	100.8	107.6
		S.D.	14.8	5.7	1.2	0.0		9.3	15.4	17.1	0.0	20.0	25.3	21.7	14.5	17.9	13.1	16.2	9.6	16.8
		Gains	+1.0	-1.2	-0.5	+0.2	2	+6.1	+3.2	+6.5	-9.6	+7.7	+8.8	+2.7	-4.9	+9.6	+4.8	+15.8	+6.0	-2.8

The pattern of gains was interesting: in two of the subtests, Grammatic Closure and Auditory Closure, gains in mean scores for Groups I and II were equal or comparable. The youngest group made almost two years of gain in Sound Blending while Group II gained +4.8 and Group III decreased -9.6. Group I gained slightly more than II and III in Visual Closure. There was a consistent increase in amount of gain in Auditory Memory with increase in chronological age (+0.7, +5.0, and +8.8) and a corresponding decrease in amount of gain in Visual Memory (+13.6, +10.6, and +2.7). As the child grows older he seems to increase dependency on auditory memory and decrease dependency on visual memory. Quantitatively the picture was:

<i>C.A. Group</i>	<i>$\bar{X}$ Auditory Memory Age</i>	<i>Gain</i>	<i>$\bar{X}$ Visual Memory Age</i>	<i>Gain</i>
<8-0	Pre 53.7		60.9	
	Post 54.4	+0.7	74.5	+13.6
8-1 to 11-0	Pre 66.6		74.0	
	Post 71.6	+5.0	84.6	+10.6
11-1 +	Pre 79.8		93.0	
	Post 88.6	+8.8	95.7	+ 2.7

The differences in gains between Auditory and Visual Memory are almost mirror images at the 8-0 and 11-1+ levels. The trend may partially account for the difficulty in increasing auditory short term memory in younger exceptional children, i.e., younger children may be more visually oriented and older children more auditorially oriented in short term memory. However, average language age for visual sequential memory was higher than for auditory sequential memory at the upper age level.

The above data refer to the language scores at the Automatic-Sequential or non-meaningful level of language. The remaining data refer to language at the representational or meaningful level. Three language processes are postulated for this level of language (reception, association, and expression) and two channels (auditory and visual).

Looking at the Auditory and Visual Reception data it can be seen that Auditory Reception gains decreased with increases in C.A. (+11.9, +10.0, and -4.9) and Visual Reception gains increased with increases in C.A. (+6.6, +7.6, and +9.6). This is exactly opposite to the trend for short term non-meaningful memory. There is a similar pattern in the gains in Auditory-Vocal Association (+12.0, +2.8, and +4.8) and Visual-Motor Association (+0.8, +4.4, and +15.8), that is, the gains were highest for Group I in the former (Auditory Reception) and the gains were highest for Group III in the latter (Visual Reception); in Auditory-Vocal Association gains also tended to decrease with

increased C.A. In expression, Group I made the greatest gains in both Vocal and Motor Expression (+7.9 and +13.5), Group II increased only slightly in Vocal Expression but Motor Expression increases were much higher for this Group (+12.6). Group III increased +6.0 in Vocal Expression and decreased -2.8 in Motor Expression. There appears to be a tendency for these children to depend less on Manual Expression as they grow older.

CHAPTER VIII SOCIAL DEVELOPMENT

The tests of social development attempted to assess changes in how the child sees himself (California Test of Personality), how others see him (a behavior checklist on activity level), and growth in social skills (Vineland Social Maturity). Each question will be discussed separately.

A. How the Child Views Himself

The data for the California Test of Personality Test is presented in percentiles. To enable the data to be handled more efficiently, the percentiles were converted to a scale from 1 to 6. A score of 1 indicated a child was unable to perform on the test; 2 referred to percentiles from 1 to 20; 3, 30 and 40th percentiles; 4, 50th percentile; 5, 60 and 70th percentile; 6, 80 and 90th percentiles. Except at the lower level, percentile descriptions for this test are compressed to indicate the nearest decile. Percentiles from 30 to 70 are considered to indicate average functioning, therefore, scores from 3 to 5 refer to average adjustment. Scores 1 and 2 would refer to below average adjustment and 6 to above average adjustment.

Means, standard deviations and gain scores for the three categories of social data are presented in Table XIII. The California Test of Personality assesses two broad areas of adjustment, personal and social. Within each area six aspects of adjustment are considered. Only three aspects of adjustment, personal, social and total adjustment, will be considered in this section dealing with performance in descriptive tests. Total adjustment is determined by combining scores in personal and social adjustment.

Two groups were functioning in the average range in personal adjustment at pretesting, Groups II and III. Group I, the Experimental group as a whole and the Contrast Group were below average. Two groups showed slight negative changes at posttesting: Experimental Group III and the Contrast Group. The Combined group of Experimental subjects increased to the low average range. Although Groups I and II made gains, Group I remained below average.

In social adjustment the Contrast Group and the Experimental subjects as a whole made minimal gains and remained in the average range. Experimental Group II moved to the low average range while Group I did not change and Group III decreased.

In general it can be stated that the Experimental Groups made slight but positive gains in personal adjustment; Group III and the Contrast Group means decreased. It should be noted that the amount of individual attention in the latter two groups was much less than for the former two groups. While the positive gains are slight, the trend should be investigated over a longer period to determine whether the variable of amount of individual attention by adults would continue to produce positive results.

Social adjustment changes followed a somewhat different pattern. Group I did not change, Group II changed in a positive direction and Group III changed in a negative direction as did the Contrast Group. It should be noted

TABLE XIII

MEANS, STANDARD DEVIATIONS & GAIN SCORES FOR SOCIAL DATA FOR
EXPERIMENTAL & CONTRAST GROUPS ON PRE AND POST TESTS

Group	N		California Test of Personality			Vineland Social Maturity Scale		
			Personal Adjustment	Social Adjustment	Total Adjustment	Activity Level	Social Age	Social Quotient
I Experimental	18	Pre X	2.2	2.7	2.3	2.2	70.7	60.7
		S.D.	0.6	1.1	0.8	1.1	30.1	18.2
		Post X	2.8	2.7	2.9	2.7	94.6	77.0
		S.D.	1.2	1.1	1.2	0.6	34.1	21.0
		Gains	+0.6	0.0	+0.6	+0.5	+23.9	+16.3
II Experimental	17	Pre X	3.0	2.5	2.6	2.6	85.0	88.8
		S.D.	1.3	0.8	0.8	0.7	19.2	15.6
		Post X	3.5	3.0	3.2	2.9	92.4	90.4
		S.D.	1.3	0.9	1.0	0.4	21.2	18.2
		Gains	+0.5	+0.5	+0.6	+0.3	+7.4	+1.6
III Experimental	18	Pre X	3.0	2.8	2.8	2.8	114.1	93.6
		S.D.	1.4	1.1	1.2	0.5	38.8	20.4
		Post X	2.8	2.4	2.7	2.7	119.9	92.6
		S.D.	1.1	1.0	0.9	0.6	40.5	19.6
		Gains	-0.2	-0.4	-0.1	-0.1	+5.8	-1.0
Total Experimental Group	53	Pre X	2.7	2.6	2.6	2.6	90.0	80.9
		S.D.	1.2	1.0	1.0	0.7	36.0	23.6
		Post X	3.0	2.7	2.9	2.7	102.5	86.6
		S.D.	1.2	1.1	1.1	0.6	35.8	21.1
		Gains	+0.3	+0.1	+0.3	+0.1	+12.5	+5.7
Contrast Group	17	Pre X	2.8	2.4	2.5	2.9	107.2	98.2
		S.D.	1.3	0.9	0.9	0.5	36.2	19.3
		Post X	2.5	2.6	2.5	3.0	112.9	91.5
		S.D.	0.9	1.2	0.9	0.5	30.6	12.9
		Gains	-0.3	+0.2	0.0	+0.1	+5.7	-0.7

that Groups I and II were in special classes within regular schools. Group III and the Contrast Group were in a separate building on the same grounds but set apart from the buildings in which the regular classes were housed. While the Group I mean score did not change, in general the attitudes of the regular class teachers became more positive towards them. Thus, while changes are negligible, there were trends and administrative settings should be investigated over a longer term to assess their effect on social development of exceptional children.

Finally, seven months of treatment geared to success is probably much too short a time to bring about marked changes in personal and social adjustment, however, two tentative trends should be further investigated.

B. How Others View the Child

The method for scoring the behavior checklist for determining the activity level of the child has already been described. The behaviors surveyed were body movements, speech, display of emotions, and interference with others. These behaviors were marked on a scale of one to five, one indicating extreme hyperactivity, five extreme hypoactivity, and three normal activity. The results are presented in Table XIII.

In all groups, activity level bordered on the hyperactive level with Group I the most hyper (2.2) and Group III and the Contrast Group the least hyper (2.8 and 2.9 respectively). All groups but Group III moved toward the "normal" category or score of 3. Group I showed the greatest amount of improvement approaching a normal activity level. Group II and the Contrast Group moved to a normal activity level while Group III made a slight negative change.

C. Social Skills

The Vineland Social Maturity Scale was administered by the child's teacher and discussed with the two senior researchers. The majority of the children were known by the teachers for a period of at least one year and the first administration of the scale was not completed until the end of the testing period, thus allowing the researchers approximately one month to observe the children. Two scores are obtained from the Vineland, Social Age and Social Quotient. The Social Age increased for both the Experimental and Contrast Groups but in two cases, the Contrast Group and Group III, the increase was not sufficient to increase the Social Quotient. The Contrast Group and Group III decreased while Group II increased. The changes, both positive and negative, are negligible. The Total Experimental Group increased +5.7 points but most of this gain was accounted for by the significant mean gain of +16.3 points made by Group I.

In summary, in the test which purports to measure how the child feels about himself (The California Test of Personality), group means changed very little in either direction but two tentative trends were noted and should be further investigated. In general, activity level moved towards normal causing teachers to view the subjects more positively. Social skills increased for all

groups (increased Social Age) but in two cases were not sufficiently large to increase Social Quotient. One group (Group I) made highly significant gains both in social skills and activity level.

D. Changes on Social Development Tasks

1. California Test of Personality:

Two tests were included to diagnose areas of strength and deficit in social functioning. The subtests of the California Test of Personality gave some indication of the child's perception of himself. The six subtests relating to Personal Adjustment are: 1A, Self Reliance; 1B, Sense of Personal Worth; 1C, Sense of Personal Freedom; 1D, Feeling of Belonging; 1E, Withdrawing Tendencies; 1F, Nervous Symptoms. The six subtests relating to Social Adjustment are: 2A, Social Standards; 2B, Social Skills; 2C, Anti-Social Tendencies; 2D, Family Relations; 2E, School Relations; 2F, Community Relations. The same scale which was used to quantify Total Personal Adjustment scores and Total Social Adjustment scores was employed to quantifying the data for the subtests. Data are presented in Table XIV.

In summary, Group I made slight positive gains in all areas, Group II made slight positive gains in Self Reliance, Sense of Personal Freedom, Withdrawing Tendencies and Nervous Symptoms, did not change in Feeling of Belonging and dropped slightly in Sense of Personal Worth. Group III made a slight positive gain in one area, Sense of Personal Freedom, and negative changes in the remaining areas.

In the Social Adjustment subtests, Groups I, II and III were within the normal range in Social Standards and Social Skills. Scores either did not change or moved slightly in a positive or negative direction. Group III was within the normal range in Anti-Social Tendencies and Family Relations and did not change. Groups I and II were below average in these two areas and made sufficient gains to move within the normal range. The three groups were below average in School Relations and only Group II made a gain in this area, a gain which placed them within the average range. Scores in Community Relations were average in the three groups and changed only slightly.

Generally it can be stated that Personal Adjustment improved more than Social Adjustment for Groups I and II while Group III showed negative change in both areas. It would appear that individual attention and interaction with a number of adults and peers are the critical factors in increasing adjustment. Group III decreased in adjustment in eight of the twelve areas. Group III was housed in a building set aside from the school buildings housing the "normal" children and the teachers were assisted by a teacher aide who worked only indirectly with the children.

2. A Test of Egocentricity:

An additional test supposedly measuring the degree of socialization the child had achieved was also administered. The test is a Piagetian task also used as a representational space test. The test requires the child to sit before a

TABLE XIV

MEANS, STANDARD DEVIATIONS & GAIN SCORE FOR SOCIAL DATA FOR
EXPERIMENTAL GROUPS ON PRE AND POSTTEST

California Test of Personality																		
Personal Adjustment										Social Adjustment						Total Social Adjustment	Total Adjustment	
Group	N	Piagetian Test of Egocentricity	S.R.	S.of P.W.	S.of P.F.	F.of B.	W.T.	N.S.	Total Personal Adjustment	ST.	SK.	Tend.	F.R.	S.R.	C.R.			
I Experimental	18	Pre X	2.3	3.2	3.1	2.7	2.7	2.3	2.8	2.2	3.3	3.1	2.6	2.8	2.7	3.3	2.7	2.3
		S.D.	1.2	1.5	1.4	0.9	1.1	0.6	1.3	0.6	1.5	1.4	1.1	1.3	1.3	1.3	1.1	0.8
		Post X	3.1	3.7	3.4	3.6	2.9	2.9	3.1	2.8	2.8	3.4	2.9	3.1	2.8	3.6	2.7	2.9
		S.D.	1.3	1.6	1.5	1.6	1.3	1.5	1.4	1.2	1.1	1.4	1.4	1.7	1.1	1.5	1.1	1.2
		Gains	+0.8	+0.5	+0.3	+0.9	+0.2	+0.6	+0.3	+0.6	-0.5	+0.3	+0.3	+0.3	+0.3	+0.1	+0.3	0.0
II Experimental	17	Pre X	2.0	4.1	4.0	3.2	3.8	3.6	2.7	3.0	4.1	3.1	2.6	2.9	2.8	2.9	2.5	2.6
		S.D.	1.0	1.7	1.8	1.0	1.2	1.8	1.3	1.3	1.5	1.0	1.2	1.1	1.2	1.4	0.8	0.8
		Post X	2.3	4.6	3.8	3.4	3.8	3.7	3.5	3.5	4.1	3.4	3.2	4.1	3.4	3.8	3.0	3.2
		S.D.	1.2	1.4	1.4	1.4	1.2	1.5	1.5	1.3	1.6	1.4	1.3	1.5	1.3	1.4	0.9	1.0
		Gains	+0.3	+0.5	-0.2	+0.2	0.0	+0.1	+0.8	+0.5	0.0	+0.3	+0.6	+1.2	+0.6	+0.7	+0.5	+0.6
III Experimental	18	Pre X	2.7	3.5	3.4	3.1	3.7	3.3	3.2	3.0	3.6	3.6	3.3	3.4	2.8	3.2	2.8	2.8
		S.D.	1.7	1.8	1.6	1.5	1.5	1.6	1.6	1.4	1.7	1.3	1.7	1.7	1.3	1.4	1.1	1.2
		Post X	3.4	3.2	2.8	3.4	3.4	3.2	3.2	2.8	3.7	3.3	3.2	3.4	2.6	2.8	2.4	2.7
		S.D.	1.3	1.3	1.4	1.3	1.5	1.5	1.5	1.1	1.6	1.6	1.4	1.5	1.2	1.3	1.0	0.9
		Gains	+0.7	-0.3	-0.6	+0.3	-0.3	-0.1	0.0	+0.2	+0.1	-0.3	-0.1	0.0	-0.2	-0.4	-0.4	-0.1
Total Experimental Group	53	Pre X	2.4	3.6	3.5	3.0	3.4	3.1	2.9	2.7	3.6	3.3	2.8	3.0	2.8	3.2	2.6	2.6
		S.D.	1.4	1.7	1.7	1.2	1.4	1.5	1.4	1.2	1.6	1.3	1.4	1.4	1.3	1.4	1.0	1.0
		Post X	2.9	3.8	3.3	3.5	3.4	3.2	3.2	3.0	3.5	3.4	3.1	3.5	2.9	3.4	2.7	2.9
		S.D.	1.4	1.6	1.5	1.5	1.4	1.5	1.5	1.2	1.6	1.5	1.4	1.6	1.3	1.5	1.1	1.1
		Gains	+0.5	+0.2	-0.2	+0.5	0.0	+0.1	+0.3	+0.3	-0.1	+0.1	+0.3	+0.5	+0.1	+0.2	+0.1	+0.3

scene of three mountains different in color and size. While the child remains in the one position a "man" moves around the mountains taking pictures. The child is required to select the picture the man would take in each position from a series of five pictures. Each series contains a picture of the child's view. The egocentric child consistently selects this picture regardless of where the man takes the picture. The theory is that before a child can see another's point of view socially he must be able to do so physically.

It was originally intended to include an analogous verbal task involving role playing but in a pilot run using the test more than 50% of the younger children could not function on the test. It was concluded that it was not valid to include the test in the battery.

The quantification of the test scores for the test of egocentricity was done in the usual manner of employing a scale of one to seven. At pretest the mean scores were within stage 1A for the three Groups. The mean scores had all increased by posttest but Group II remained at stage 1A. The amount of gain for the three groups was similar but Group II made the least gain.

The data were also analyzed by C.A. group. The results are presented in Table XV. In the California Test of Personality, changes were minimal for the three groups for Feeling of Belonging, Withdrawing Tendencies, Social Skills, Sense of Personal Worth, and only slightly higher for Nervous Symptoms, Total Personal Adjustment, Community Relations and Total Social Adjustment. Groups I and II increased or decreased slightly in Self Reliance and Sense of Personal Freedom while Group III increased to the fiftieth percentile. In general, Group III increased in the personal but decreased in the social adjustment subtests; Group I increased in most of the former and all but one of the latter and Group II showed no consistent pattern.

In activity level Group I made minimal change and remained still slightly hyperactive, Group II approached normal activity level and Group III remained unchanged (2.9), just below the average score of 3.0.

The three groups increased in Social Age and increases were sufficiently large to increase Social Quotient or rate of social growth. Groups I and III made a negligible gain.

In the test of egocentricity the familiar pattern of higher stage with increase in C.A. was found for Groups I and III and the increases followed the same pattern: Group I increased from near stage 0 to stage 1A and Group II from stage 1A to 1B. Group III remained almost unchanged. The C.A. norms as determined by Laurendeau and Pinard (1970, p. 437) are stage 0 for the age range below 6 years, stage 1A for the 6 to 6½ year range, stage 1B from 6½ to 8½ years, stage 2A from 8½ to just under 12 years and the remaining stages above this age level. Group I was approximately one to two years below the norms and Group II approximately three years. Group III changed slightly from 3.9 to 3.8 or stage 2A. There appears to be very little movement in social development beyond C.A. 11 years. Prescriptive teaching did *not* displace the rate of development for Group III in this test of egocentricity.

TABLE XV

MEANS, STANDARD DEVIATIONS & GAIN SCORES FOR SOCIAL DATA
FOR THREE CHRONOLOGICAL AGE LEVELS OF THE EXPERIMENTAL SUBJECTS

		California Test of Personality										Social Adjustment							Vineland Social Maturity Scale		
		Personal Adjustment																			
C.A. Group	N.	Test of Egocentricity	S.R.	S of P.W.	S of P.F.	F of B.	W.T.	N.S.	Pers. Adj.	S. ST.	S. SK.	A.S. Tend.	F.R.	S.R.	C.R.	Soc. Adj.	Total Adj.	Activity Level	S.A.	S.Q.	
8-0	19	Pre X	1.7	3.3	3.3	3.0	3.0	2.8	2.6	2.6	3.4	3.0	2.4	2.3	2.4	2.5	2.2	2.2	2.5	65.8	77.1
		S.D.	1.1	1.8	1.9	1.2	1.3	1.6	1.5	1.2	1.7	1.4	1.2	0.8	1.1	0.9	0.8	0.8		18.0	21.8
		Post X	2.2	3.8	3.2	3.4	3.1	3.0	3.0	2.9	3.0	3.3	3.2	3.4	3.1	3.2	2.6	3.0	2.6	81.6	87.6
		S.D.	1.3	1.8	1.4	1.5	1.3	1.6	1.4	1.3	1.4	1.5	1.7	1.8	1.4	1.4	1.1	1.2		20.1	21.3
		Gains	+0.5	+0.5	-0.1	+0.4	+0.1	+0.2	+0.4	+0.3	-0.4	+0.3	+0.8	+1.1	+0.7	+0.7	+0.4	+0.8	+0.1	+15.8	+10.5
8-1 to 11-0	25	Pre X	2.3	3.8	3.7	3.1	3.4	3.2	2.8	2.7	3.2	3.4	2.8	2.9	3.0	3.3	2.6	2.6	2.5	93.0	81.9
		S.D.	1.2	1.8	1.5	1.2	1.4	1.5	1.2	1.1	1.4	1.2	1.3	1.2	1.3	1.4	0.9	0.9		28.1	24.5
		Post X	3.2	3.7	3.4	3.3	3.2	2.5	3.1	3.0	3.7	3.3	2.9	3.3	2.8	3.4	2.6	2.7	2.8	99.1	82.0
		S.D.	1.1	1.5	1.7	1.5	1.2	1.5	1.4	1.2	1.5	1.5	1.1	1.4	1.1	1.5	0.7	0.8		27.2	20.9
		Gains	+0.9	-0.1	-0.3	+0.2	-0.2	+0.3	+0.3	+0.3	+0.5	-0.1	+0.1	+0.4	-0.2	+0.1	0.0	+0.1	+0.3	+6.0	+0.1
11-1+	9	Pre X	3.9	3.3	3.3	2.8	4.2	3.2	3.9	3.2	5.1	3.7	3.8	5.0	3.0	4.0	3.7	3.3	2.9	132.8	86.1
		S.D.	1.3	1.3	1.3	1.2	1.1	1.2	1.5	1.2	0.9	1.2	1.4	1.2	1.2	1.4	1.2	1.3		37.9	22.0
		Post X	3.8	4.0	3.4	3.9	4.3	3.2	4.1	3.4	4.3	3.6	3.4	4.6	3.0	3.8	3.2	3.6	2.9	155.9	97.1
		S.D.	1.3	1.2	1.3	1.1	1.4	1.3	1.7	1.3	1.5	1.4	1.3	1.4	1.2	1.6	1.5	1.2		26.2	15.0
		Gains	-0.1	+0.7	+0.1	+1.1	+0.1	0.0	+0.2	+0.2	-0.8	-0.1	-0.4	-0.4	0.0	-0.2	-0.5	+0.3	0.0	+23.1	+11.0

CHAPTER IX ACADEMIC DEVELOPMENT

Two measures were administered to assess achievement. For the non-academic group (those without measureable academic skills) the Metropolitan Readiness Test was administered. Five Contrast subjects and 31 Experimental subjects were in the group. There are six areas assessed in the test: Word Meaning, Listening, Matching, Alphabet, Number, and Copying; there is also a total readiness score. The scores for each subtest and the total are presented as percentiles which are changed to letter descriptions. The scale of letter scores is from A to E. A score of A indicates excellent prognosis for reading (or number if one considers number separately); B, very good prognosis; C, average; D, below average; and E indicates teaching of reading should not be attempted. On the numerical scale A=5, B=4, C=3, D=2, E=1. Two areas will be considered first, total readiness and number. Means, standard deviations and gain scores for the achievement data are presented in Table XVI.

At pre-test the mean scores for Groups I and II indicated average prognosis for reading. Group III and the Contrast Group were below average. Although all groups increased in the average mean for total readiness, the Contrast Group remained below the score of 3 indicating they were not yet ready for formal instruction in reading at posttest. The same pattern was followed for number except that Group III and the Contrast Group were below the score of 3 at posttest. Apparently the remediation techniques were more effective than the traditional techniques for both number and total reading readiness, however, while means for total readiness scores and number scores were higher for the Experimental Groups the Contrast Group surpassed the Experimental Groups in performance on several subtests.

For children with measureable academic skills several subtests from the Stanford Achievement Test Battery were administered. Scores on this test are expressed as grade norms, e.g., 2.1 means the first month of grade 2; part grade scores are described in tenths. The tests administered included Word Meaning (word attack skills), Paragraph Meaning (reading comprehension), Spelling and Arithmetic. The two reading subtests were averaged for a average reading score. Twelve subjects from the Contrast Group were administered these tests and twenty-two subjects from the Experimental Group.

At the time of pretesting the Contrast Group mean in Word Meaning was Grade 2.0 and the Experimental Group mean was Grade 2.3. The Experimental Groups ranged from Grade 1.9 (Group II) to Grade 2.5 for Group III. The Contrast Group mean increased +0.1 (or one-tenth of a school year over a seven month period) compared to an average of three months for the Total Experimental Group.

The mean grade for Paragraph Meaning for the Contrast Group decreased to Grade 1.9 from 2.1, while the Total Experimental Group increased to Grade 2.5 from 2.1 during the same period. The scores for the Experimental Group increased 3 months, 3 months and 6 months for Group I, II, and III

TABLE XVI

MEANS, STANDARD DEVIATIONS & GAIN SCORES FOR ACHIEVEMENT DATA
FOR EXPERIMENTAL AND CONTRAST GROUPS ON PRE AND POSTTESTS

Group	N		Readiness Tests							N	Achievement Tests				
			Word Meaning	Listening	Matching	Alphabet	Number	Copying	Total		Word Meaning	Paragraph Meaning	X Reading	Spelling	Arithmetic
I Experimental	12	Pre X	3.7	3.3	3.3	3.3	2.2	3.1	3.0	6	2.2	2.2	2.2	1.8	2.0
		S.D.	0.9	0.9	0.6	1.0	0.6	0.9	0.7		0.5	0.6	0.3	0.4	0.6
		Post X	3.5	3.6	3.6	4.0	3.5	3.5	3.8		2.3	2.5	2.4	2.4	2.3
		S.D.	0.8	0.8	0.8	0.7	1.0	1.0	0.8		0.4	0.6	0.5	0.9	0.6
		Gains	-0.2	+0.3	+0.3	+0.7	+1.3	+0.4	+0.8		+0.1	+0.3	+0.2	+0.6	+0.3
II Experimental	13	Pre X	3.1	3.2	3.2	3.9	2.5	3.4	3.2	4	1.9	1.7	1.8	2.1	1.6
		S.D.	0.9	0.9	0.8	0.8	1.0	1.3	0.9		0.4	0.5	0.3	0.4	0.3
		Post X	3.0	3.5	3.5	4.4	3.7	3.3	4.0		2.2	2.0	2.1	2.1	1.8
		S.D.	0.9	0.6	0.9	0.6	1.3	1.1	1.0		1.4	0.4	0.4	0.5	0.5
		Gains	-0.1	+0.3	+0.3	+0.5	+1.2	-0.1	+0.8		+0.3	+0.3	+0.3	0.0	+0.2
III Experimental	6	Pre X	2.8	3.2	2.8	3.0	1.5	2.1	2.7	12	2.5	2.1	2.4	2.3	2.4
		S.D.	0.9	0.7	0.4	1.2	0.5	0.7	0.8		1.0	1.0	1.0	1.3	0.8
		Post X	2.5	3.7	3.3	4.0	2.7	2.3	3.3		2.8	2.7	2.8	2.6	2.9
		S.D.	1.0	1.0	0.5	0.6	0.5	0.8	0.5		1.2	1.1	1.1	1.2	1.0
		Gains	-0.3	+0.5	+0.5	+1.0	+1.2	0.0	+0.6		+0.3	+0.6	+0.4	+0.3	+0.5
Total Experimental Group	31	Pre X	3.3	3.2	3.2	3.5	2.2	3.1	3.0	22	2.3	2.1	2.2	2.1	2.1
		S.D.	1.1	0.9	0.7	1.1	0.9	1.2	0.8		0.9	0.9	0.8	1.0	0.8
		Post X	3.1	3.6	3.5	4.2	3.4	3.2	3.8		2.6	2.5	2.6	2.5	2.6
		S.D.	0.9	0.8	0.8	0.7	1.1	1.0	0.9		1.0	0.9	0.9	0.9	0.9
		Gains	-0.2	+0.4	+0.3	+0.7	+1.2	+0.1	+0.8		+0.3	+0.4	+0.4	+0.4	+0.5
Contrast Group	5	Pre X	1.4	1.6	1.8	2.6	1.6	1.6	2.2	153	2.0	2.1	2.0	1.9	1.6
		S.D.	0.9	0.9	0.8	0.9	0.6	0.9	0.8		0.6	0.7	0.6	0.8	0.5
		Post X	2.4	2.2	2.4	3.4	2.4	2.2	2.6		2.1	1.9	2.0	2.2	1.8
		S.D.	0.9	0.5	0.6	0.9	0.9	0.5	0.6		0.7	0.6	0.6	0.8	0.5
		Gains	+1.0	+0.6	+0.6	+0.8	+0.8	+0.6	+0.4		+0.1	-0.2	0.0	+0.3	+0.2

respectively. In summary, the average reading grades for the Contrast Group did not change but the Total Experimental Group increased four-tenths of a grade.

The Contrast Group and Total Experimental Group mean gains in Spelling were 3 and 4 months respectively with Experimental Groups I and III gaining 6 and 3 months while Group II remained unchanged. It would appear the traditional program and the prescriptive teaching program worked equally well in teaching Spelling.

Finally, all groups showed gains in Arithmetic but the Contrast Group and Group II made equal gains of 2 months. The Total Experimental Group gained 5 months and Groups I and III gained 3 and 5 months respectively.

To summarize, the Experimental Groups made higher gains than the Contrast Group in Total Readiness, Readiness for Number, Word Meaning, Paragraph Meaning and Arithmetic but both groups were almost equal in performance in spelling. Although gains did not meet the criterion, an average of seven months in a seven-month teaching period, individual children did accomplish this goal. Among the subjects in the experimental groups the highest level of achievement attained by any child was one and three-tenths grades in reading, eight-tenths of a grade in spelling and one and six-tenths in arithmetic.

Two areas of academic achievement, number and reading were diagnosed rather thoroughly to determine where the child was achieving and what was the nature of his specific difficulties. One area, number was posstested. The Doren Diagnostic Reading test was administered to those children who had any measureable reading ability. The profile of word attack skills served as a basis for remediation. Other abilities, as determined for example on the Wepman Auditory Discrimination Test and the ITPA helped to isolate areas of deficit.

The diagnostic number test was one constructed by the author under the direction of Prof. K. Lovell, University of Leeds, England, for an earlier study on arithmetic disabilities. The content deals with understanding of the natural number system: concepts associated with counting, place value, properties of the natural number system, and computational skills. The concepts were ranked for grade level by comparing the concept with where it appeared in the graded curriculum of the Edmonton Public School System. The top scores for each area tested at each grade level are presented below:

MAXIMUM SCORES POSSIBLE AT EACH GRADE LEVEL IN THE DIAGNOSTIC ARITHMETIC TEST

Number Skill	I	II	III	IV	V	VI
Counting	11	16	22	26	28	28
Place Value**	10	28	—	—	—	—
Properties	3	6	15	18	18	21
Computational Skills	2	7	27	34	44	56
Total Number Score	26	57	64	78	90	107

**Place Value was considered only to 999

The testing was administered individually and the child verbalized the method he/she was using to solve the problem, step-by-step. In this manner, it was possible to determine the nature of any misunderstanding. For example, in presenting the place value question for 121 the child is asked how many times bigger is this 1 in (1)21 than this 1, 12(1)? The most frequent error was to subtract 1 from 100 and arrive at the answer 99. In presenting the following addition item: $12 + 23 + 32$, one would not know why the child arrived at the answer 13 unless he verbalized as he proceeded: $2 + 3 = 5 + 2 = 7 + 3 = 10 + 2 = 12 + 1 = 13$. This was also a frequent type of error. The arithmetic diagnoses are presented in Table XVII.

Subjects in each group increased in their understanding of counting concepts but the highest level attained remained at the mid-grade two point. The same result occurred for place value concepts. Results were somewhat better for understanding of the properties of the natural number system where Group I attained the Grade 1 level, Group II a mid-grade 2 level and Group III a mid-grade 3 level.

Group I attained a Grade 2 level in computational skills while Group II moved from beginning Grade 2 to mid-grade 3. Group II made a minimal gain but it should be remembered this was the youngest group and the majority were still functioning at the readiness stage.

The data for the diagnostic arithmetic test analyzed by C.A group are reported in Table XVIII. The younger subjects moved from no understanding to mid-grade 1 in counting concepts while Group II moved from mid-grade 1 to end of Grade 1 and Group III from beginning Grade 2 to end of Grade 3. In understanding of place value concepts Group I remained at beginning Grade 1, Group II at mid-grade 1 and Group III at mid-grade 2.

Group I attained mid-grade 1 in understanding of the properties of the natural number system while Group II moved from Grade 1 to beginning Grade 2 and Group III moved from mid-grade 2 to beginning Grade 3. Group I moved from no understanding of computational skills to mid-grade 1, Group II from end of Grade 1 to mid-grade 2 and Group III from mid-grade 3 to approaching top scores for Grade 3. The two areas of greatest difficulty for these children appeared to be in concepts related to place value and properties of the natural number system.

The analysis of the standardized achievement test data by C.A. groups is presented in Table XIX. The data include the Metropolitan Readiness and Stanford Achievement Test results. Either the readiness test or the achievement test was administered to a subject, but not both. Seventeen of the below 8-year group were administered the readiness test, while 14 of the 8 to 11 group and no subject in the 11+ group were administered the readiness test. The numbers of subjects administered the achievement test were 2, 11 and 9 in Groups I, II and III, respectively.

In the Readiness Test results the youngest group (Group I) pretested at less than the average level required for initiating a reading program in word meaning, copying and total readiness, as well as the number subtest. At

TABLE XVII

MEANS, STANDARD DEVIATIONS AND GAIN SCORES FOR DIAGNOSTIC ARITHMETIC DATA FOR
EXPERIMENTAL GROUPS ON PRE AND POSTTESTS

Group	N		Diagnostic Arithmetic				Total Arithmetic Score
			Counting	Place Value	Properties	Computational Skills	
I Experimental	18	Pre $\bar{X}$	6.3	6.2	1.7	2.8	17.1
		S.D.	6.2	5.8	0.9	5.7	17.3
		Post $\bar{X}$	8.5	6.4	2.9	6.0	23.8
		S.D.	6.9	7.8	3.0	7.6	24.0
		Gains	+2.2	+0.2	+1.2	+3.2	+6.7
II Experimental	17	Pre $\bar{X}$	4.4	3.6	2.7	0.6	11.3
		S.D.	3.4	1.6	2.6	1.0	7.3
		Post $\bar{X}$	8.4	4.9	3.7	1.8	18.8
		S.D.	6.0	5.2	2.7	2.1	13.4
		Gains	+4.0	+1.3	+1.0	+1.2	+7.5
III Experimental	18	Pre $\bar{X}$	11.6	10.7	3.2	6.8	32.3
		S.D.	9.1	9.2	3.1	8.9	27.9
		Post $\bar{X}$	13.4	11.9	4.9	11.4	41.7
		S.D.	9.8	10.5	4.1	11.5	33.4
		Gains	+1.8	+1.2	+1.7	+4.6	+9.4
Total Experimental Group	53	Pre $\bar{X}$	7.5	6.9	2.5	3.5	20.4
		S.D.	7.4	7.1	2.5	6.8	21.7
		Post $\bar{X}$	10.1	7.8	3.9	6.5	28.3
		S.D.	8.2	8.8	3.5	9.1	27.3
		Gains	+2.6	+0.9	+1.4	+3.0	+7.9

TABLE XVIII
MEANS, STANDARD DEVIATIONS & GAIN SCORES FOR DIAGNOSTIC ARITHMETIC DATA
FOR EXPERIMENTAL GROUPS AT THREE CHRONOLOGICAL AGE LEVELS

<i>C.A. Group</i>	<i>N</i>		<i>Counting</i>	<i>Place Value</i>	<i>Properties of the Natural Number System</i>	<i>Computational Skills</i>	<i>Total Score</i>
8-0	19	Pre X	2.5	3.2	1.4	0.1	7.2
		S.D.	2.5	1.8	1.3	0.2	4.7
		Post X	4.7	2.7	2.1	1.1	10.6
		S.D.	4.5	2.4	2.4	1.8	9.2
		Gains	+2.2	-0.5	+0.7	+1.0	+3.4
8-1 to 11-0	25	Pre X	7.4	5.4	2.6	2.2	17.6
		S.D.	5.7	4.7	2.4	3.0	13.7
		Post X	10.2	6.8	3.9	4.8	25.6
		S.D.	6.9	7.3	3.0	4.7	18.7
		Gains	+2.8	+1.4	+1.3	+2.6	+8.0
11-0+	9	Pre X	18.4	18.7	4.7	14.2	56.0
		S.D.	6.3	7.2	3.0	9.8	22.0
		Post X	21.4	21.4	7.6	22.4	72.9
		S.D.	5.0	6.8	3.6	9.3	21.9
		Gains	+3.0	+2.7	+2.9	+8.2	+16.9

TABLE XIX

MEANS, STANDARD DEVIATIONS & GAIN SCORES FOR STANDARDIZED
ACHIEVEMENT DATA FOR EXPERIMENTAL GROUPS
AT THREE CHRONOLOGICAL AGE LEVELS

		Readiness Tests							Stanford Achievement Tests						
C.A. Group	N	Word Meaning	Listening	Matching	Alphabet	Number	Copying	Total Readiness	N	Word Meaning	Par. Meaning	Avg. Reading	Spell	Arith.	
<8-0	17	Pre X	2.9	3.1	3.0	3.5	2.1	2.9	2.8	2	1.8	0.9	1.4	1.3	1.3
		S.D.	1.1	1.0	0.6	1.0	1.0	1.2	0.8						
		Post X	2.9	3.4	3.4	4.1	3.3	3.1	3.6		2.3	1.5	1.9	2.0	1.3
		S.D.	1.0	0.7	0.9	0.7	1.2	1.1	0.9						
		Gains	0.0	+0.3	+0.4	+0.6	+1.2	+0.2	+0.8		+0.5	+0.6	+0.5	+0.7	0.0
8-1 to 11-0	14	Pre X	3.6	3.4	3.4	3.6	2.3	3.3	3.4	11	1.8	1.7	1.8	1.8	1.8
		S.D.	0.9	0.6	0.7	1.1	0.7	1.0	0.7		0.5	0.4	0.4	0.7	0.6
		Post X	3.3	3.8	3.6	4.2	3.6	3.4	4.1		1.6	1.7	1.7	1.6	1.8
		S.D.	0.8	0.8	0.7	0.7	1.0	1.0	0.8		0.9	1.1	1.0	0.9	1.1
		Gains	-0.3	+0.4	+0.2	+0.6	+1.3	+0.1	+0.7		-0.2	0.0	-0.1	-0.2	0.0
11-0+	0	Pre X	*	*	*	*	*	*	*	9	3.1	2.8	2.9	2.7	2.7
		S.D.									0.7	0.7	0.7	1.1	0.7
		Post X	*	*	*	*	*	*	*		3.3	3.2	3.3	3.1	3.2
		S.D.									1.0	0.7	0.8	1.0	0.9
		Gains	*	*	*	*	*	*	*		+0.2	+0.4	+0.4	+0.4	+0.5

* Not administered

posttest Group I approached the score of 4 (very good prognosis) in 5 of the 6 tests. The greatest progress was made in alphabet and number. There was no change in the mean score in word meaning in spite of the emphasis placed in this area.

At pretest, Group II scored in the average range on every test except number. The change in word meaning, while slight, was in a negative direction. There was positive change for the remaining areas. In spite of the age difference the two groups were very similar at pretest and remained so at posttest. The greatest progress for both groups was made in number readiness, followed by total readiness.

In April and May Groups I and II were considered "ready" for beginning formal reading experiences with the readiness program continuing concurrently, although Group II required much less time for building basic skills. In view of their initial success in formal reading and arithmetic programs (teachers' opinion) it would appear the time spent in building pre-academic skills was time well spent for these children.

Although only two Group I subjects were in a formal academic program, the gain scores ranged from five to seven months in a seven-month period. In view of the small number in this group it is impossible to generalize except to caution administrators against segregating young children before other possibilities have been explored. One of the two children was in the group assisted by a Resource Teacher and the other in the group assisted by a Teacher Aide. It was recommended that both children be transferred to a regular class and given required support by a Resource Teacher.

Eleven of the 25 children in the 8 to 11 group had initiated formal academic programs before the study began and therefore it was decided to continue. However, a remedial program in basic skills was also initiated because it was obvious any learning which had occurred was at a rote level. The approach to academic programs was changed in order to build on strengths and/or build in required skills. For example, children might be functioning mechanically in computational arithmetic, yet be preoperational and completely lacking in any understanding of number concepts. A program such as the Fletcher Math Program, might be employed in order to "teach for understanding" while building a basic foundation. The academic program for Group II was the least successful aspect of the project. Mean gain scores either remained unchanged or dropped slightly. The children in Group II had built up unfavorable attitudes towards academic work and had developed numerous ingenious ways of "failure avoiding." Although not measured by the tests, it was observed by those working with the children that attitudes improved considerably and time periods when formal work could be undertaken increased greatly. With improved attitudes a longer period of instruction might produce the required results.

The oldest group did improve in all academic areas with mean gains from 2 to 5 months in a 7-month period. This was considered noteworthy since an earlier trend of regression was reversed. Attitudes among this group also improved considerably.

CHAPTER X

RESULTS: ANALYSIS OF COVARIANCE

Two groups of subjects were administered two types of measures to assess the relative value of prescriptive and traditional teaching programs for exceptional children. Two groups were included: Experimental Subjects to whom a treatment program based on a prescriptive or diagnostic teaching model was administered, and a Contrast Group who continued to receive a traditional, eclectic educational program.

Two types of measures were administered. The first type of measures, termed descriptive, were administered to both Experimental and Contrast Subjects. The descriptive tests were intended to measure areas of growth in which increased scores supposedly resulted from transfer of abilities, rather than increase in abilities due to direct teaching. The descriptive tests were hypothesized to measure intellectual, perceptual-motor, social and academic development.

The second group of measures, termed diagnostic or psychoeducational tests, were intended to assess specific deficits and strengths. They were used directly to plan prescriptive teaching programs for the treatment groups.

The Treatment Subjects ($N = 53$) were subdivided into three groups with each housed in two segregated special classrooms, and a different administrative plan followed in implementing the prescriptive teaching program. Group I teachers were assisted by both resource teacher and teacher aides. Group II teachers were assisted by resource teachers only, while Group III teachers were assisted by teacher aides only. The Contrast Group was housed in three segregated special classrooms, the teachers received no additional assistance and continued with a traditional, and in this instance, an eclectic teaching program.

Means, standard deviations and gain scores were computed for each group for each of the tests and subtests administered. Results have been reported in previous chapters. Because of the weaknesses inherent in gain score statistics, analysis of covariance was computed as the second step in analysis of data. Pre-measures were used as the covariate in the analysis of covariance. When significant overall effects were detected, Scheffé tests on adjusted means were carried out using .05 significance level. The analysis of covariance was computed for: (1) the descriptive data for the Experimental and Contrast Subjects; (2) the diagnostic data for the three Experimental groups; (3) the data for the Experimental subjects subdivided into three chronological age groups.

1. Analysis of Covariance: Experimental and Contrast Groups

The results for the comparisons of the Experimental and Contrast Subjects are presented in Table XX. Any values that exceed 9.45 [$F(3,65)$] are significant at .05 level using Scheffé test on adjusted means. Significant overall effects were detected for nine of the 34 variables. Only significant values are recorded. Where no significant values were found for pairs of groups for a variable showing overall significant effects (e.g. multiplication of classes), the table cells are left vacant.

TABLE XX
ANALYSIS OF COVARIANCE FOR THE EXPERIMENTAL GROUPS
AND THE CONTRAST GROUP

Variable	Gp Ivs2	Gp Ivs3	Gp Ivs4	Gp 2vs3	Gp 2vs4	Gp 3vs4
Stanford-Binet IQ						10.97
WISC Verbal IQ	16.94					
WISC Full Scale IQ	14.97	10.92				
WISC Pattern Conceptualization	16.69	12.81				
Logical Development Multiplication of Classes Seriation	10.32					
Draw-A-Man Test				12.12		
Vineland Social Age						
Achievement Paragraph Meaning*			15.95			

*F (3,65) at .05 = 2.45

Four groups were compared. Group I is the Contrast Group, Group II is the experimental group utilizing resource teachers and teacher aides, Group III the experimental group utilizing resource teacher only, and Group IV the experimental group utilizing the teacher aide only. For two variables, multiplication of classes and Vineland Social Age, there were significant overall effects but the comparisons between pairs of groups were not significant at the .05 level when the Scheffé test on adjusted means was computed.

Nine of the comparisons of the adjusted means of the pairs of groups were significant. There were significant differences between Groups III and IV on the Stanford Binet IQ where the adjusted mean for Group III was 72.94 and for Group IV, 79.33. No other comparisons of pairs of groups were significant for this variable. Seven of the comparisons which were significant involved the Contrast Group. The Contrast Group and Group II comparisons were significant for WISC verbal IQ. The comparisons for the Contrast Group and Groups II and III were significant for the variable, WISC Full Scale IQ. The adjusted means were 71.99 for the Contrast Group and 80.72 and 79.61 for Groups II and III respectively. The comparisons for the Contrast Group and Groups II and III were also significant for the WISC conceptualization pattern (the sum of the scaled scores for the Comprehension, Similarities and Vocabulary subtests). The adjusted means were 17.32, 23.99 and 23.19 for the Contrast Group (Group I) and Groups II and III respectively.

Although overall effects were detected for the logical thinking test, multiplication of classes, the comparisons between groups were not significant. Only one comparison in the logical thinking tests was significant, the comparison between the Contrast Group and Group II for the seriation test. The adjusted means were 2.54 (stage 1A) and 4.06 (stage 2A) for the Contrast Group and Group I.

For the Draw-A-Man test the comparison between Groups II and III, both experimental groups, was significant. The adjusted means were 64.54 and 74.84 respectively. The comparison between Groups II and IV, both experimental groups, approached significance with a value of 9.12. The adjusted means were 64.54 and 73.49 for Groups II and IV respectively.

There were significant differences for one of the achievement tests, paragraph meaning or reading comprehension. The comparison between Group I (Contrast) and Group IV was significant. The adjusted means for the two groups were 1.89 and 2.66. For this test the comparison between Groups I and II also approached significance. The comparison value was 9.21 and the adjusted means for the two groups were 1.89 and 2.35 respectively.

In summary, when the Contrast and Experimental Groups were compared, nine comparisons of pairs of group means were significant. Six of the comparisons involved the Contrast Group and in each case the mean for the Contrast Group was the lower mean. Eight of the comparisons involved the ability to conceptualize and understand: Stanford Binet IQ, WISC verbal IQ and Full Scale IQ, WISC conceptualization pattern, seriation and reading comprehension. Four of the comparisons favored Group II, the group utilizing both resource teachers and teacher aides. It should be remembered that Group II most resembled the Contrast Group on the pretest and that both groups generally had the lowest mean scores at pretest.

II. *Analysis of Covariance: Diagnostic Test Data for Three Experimental Groups*

The results for the comparisons for the Experimental Groups are presented in Table XXI. Any values that exceed 6.46 [$F(2,49)$] are significant at the .05 level using Scheffé test on adjusted means.

Significant overall effects were detected for nine of the 98 variables. Only significant values are recorded. Where no significant values were found for pairs of means for a variable showing overall significant effects, the table cells are left vacant.

Three groups are compared: Experimental Group I (resource teacher and teacher aide), Experimental Group II (resource teacher) and Experimental Group III (teacher aide). For one variable, paragraph meaning, there were significant overall effects but the comparisons between pairs of group means were not significant at the .05 level, when the Scheffé test on adjusted means was computed.

TABLE XXI
ANALYSIS OF COVARIANCE FOR THREE EXPERIMENTAL GROUPS

Variable	Gp 1vs2	Gp 1vs3	Gp 2vs3
WISC: Picture Arrangement	_____	_____	12.55
Logical Development: Multiplication of Classes	_____	12.73	_____
Purdue Perceptual-Motor Survey:			
Body Image	12.44	_____	_____
Perceptual-Motor Match	11.01	_____	_____
Ocular Control	15.94	18.92	_____
Total Motor Score	_____	_____	_____
Draw-A-Man Test	6.92	_____	_____
Piagetian Space Test:			
Left-Right	_____	9.22	8.95
Achievement:			
Paragraph Meaning*	_____	_____	_____

*F(2,49) at .05 = 6.46

Nine of the comparisons of the adjusted means for pairs of groups were significant. Seven of the comparisons involved Group I, five involved Group III and six involved Group II.

There were significant differences between Groups II and III for the WISC Picture Arrangement subtest where the adjusted means were 8.94 and 6.46 respectively. If, as Glasser and Zimmerman state (1970, p. 76), performance on Picture Arrangement indicates "social alertness and common sense as revealed in the application of so-called 'social' intelligence, that is, intelligence applied to social or inter-personal relations", then detection of significant differences for this variable is consistent with the findings in the social adjustment data as measured by the California Test of Personality. Groups I and II made higher gains than Group III. The adjusted mean for Group I, while not significant, was also higher than the adjusted mean for Group III (7.71 vs 6.46).

Comparison of one variable in logical thinking was significant, the comparison between Groups I and III in multiplication of classes. The significant value was 12.73 and the adjusted means were 5.5 and 6.9 for Groups I and III respectively.

Four of the comparisons where significant differences were detected involved the variables measured by the Purdue Perceptual-Motor Survey, and three comparisons involved Groups I and II. There were significant differences between Groups I and II for Body Image, Perceptual-Motor Match and Ocular Control, and between Groups I and III for Ocular Control. There were significant overall effects for Total Motor Score but none of the between group comparisons was significant. In comparing the subtest mean scores for Body Image for Groups I and II, the value was 12.44 and the adjusted means for Groups I and II were 5.98 and 4.35. In comparing the Perceptual-Motor Match subtest mean scores for the same groups, the value was 11.01 and the adjusted means were 5.06 and 3.9 for Groups I and II respectively. Finally, in comparing the Ocular Control subtest mean scores for Groups I and II the value was 15.94 and the adjusted means were 6.41 and 4.65. For the same subtest when Groups I and III were compared, the value was 18.92 and the adjusted means were 6.41 and 4.42 for the two groups respectively.

There were significant differences between Groups I and II for the Draw-A-Man Test. The value was 6.92 and the adjusted means were 5.76 and 4.43 for the two groups. There were significant differences for one other space test, the Piagetian representational space test of the concept of opposition of left and right. The significant differences were between Groups I and III, and II and III. For the former, the value was 9.22 and the adjusted means were 3.08 and 4.37; in the latter case, the value was 8.95 and the adjusted means were 3.05 and 4.37 for Groups II and III respectively.

Significant overall effects were detected for the variable, paragraph meaning, but none of the comparisons of pairs of means was significant.

In summary, for nine of the 98 variables significant overall effects were detected on the analysis of covariance. The comparisons for pairs of means were not significant for two of the variables. One significant comparison

involved Groups II and III for the WISC Picture Arrangement subtest, thought to be measuring "social" differences. The differences were in favor of Group II. This finding is consistent with the findings on the gain scores in the social data as measured by the California Test of Personality. One significant comparison involved the variable, multiplication of classes and Groups I and III. The differences were in favor of Group III.

The remaining significant comparisons involved some aspect of motor or perceptual-motor ability: Body Image (Groups I and II), Perceptual-Motor Match (Groups I and II), Ocular Control (Groups I and II, and I and III), Draw-A-Man (Groups I and II), and the concept of opposition of left and right (Groups I and II and III). The comparisons favored Group I for the Purdue perceptual-motor tasks and the Draw-A-Man test. For the left-right test the comparisons were between Groups I and III, and II and III, with Group III having the higher mean scores in both cases.

It should be noted that when Contrast and Experimental Groups were compared on the descriptive data, the majority of comparisons involved conceptual tasks and were in favor of the Experimental Groups. In the comparisons involving diagnostic test data for the Experimental Subjects, seven of the nine significant comparisons involved perceptual-motor data.

III. *Analysis of Covariance: Experimental Subjects in Three Chronological Age Groups*

The 53 subjects in the three experimental groups were regrouped by chronological age and administrative criteria were ignored. An analysis of covariance was computed for the data for the three C.A. groups. Where significant overall effects were detected, Scheffé tests on adjusted means were applied using .05 significance level. Any values that exceed 6.46 [$F(2,49)$] are significant at the .05 level.

The results for the comparisons for the C.A. groups are presented in Table XXII. Significant overall effects were detected for ten variables. It was not possible to do an analysis of covariance by C.A. on the readiness or Stanford Achievement test variables because there were only nine subjects in Group III.

Only significant values are recorded. Significant values were found for pairs of groups for each of the ten variables where overall significant effects were detected. Three groups are compared. Group I is the C.A. group below eight years of age; Group II is the C.A. 8 to 11 group and Group III the C.A. 11-1+ group. Eighteen comparisons of the adjusted means were significant.

There were significant differences between Groups I and II, and I and III on the Piagetian task, measurement of length, where the adjusted means for Groups I, II, and III were 1.98, 3.41 and 4.69 respectively. There were significant differences between Groups I and II for the Harris Test of Lateral Dominance for the question, "Is dominance established?" The adjusted means were 1.30 and 1.68 for Groups I and II respectively.

TABLE XXII
ANALYSIS OF COVARIANCE FOR EXPERIMENTAL SUBJECTS
AT THREE CHRONOLOGICAL AGE LEVELS

Variable	Gp 1vs2	Gp 1vs3	Gp 2vs3
Measurement of Length	9.75	14.04	—
Purdue: Body Image	—	13.02	—
Harris: Dominance Established	7.98	—	—
Piagetian Space Tests:			
Topographical Relations	10.47	9.01	—
Left-Right	—	17.40	12.43
ITPA:			
PLA	—	10.53	7.21
Auditory Reception	8.32	8.81	—
Visual Motor Association	—	17.94	8.86
Vineland Maturity Scale:			
Social Age	—	10.26	19.19
Diagnostic Number Test:			
Computational Skills	—	30.41	16.33

*F (2,49) at .05 = 6.46

There were significant differences for the two Piagetian space tests. For the localization of topographical positions test the significant differences were between Groups I and II where the adjusted means were 4.72 and 5.57, and Groups I and III where the adjusted means were 4.72 and 5.78. For the concept of opposition of left and right test the significant differences were between Groups I and III where the adjusted means were 3.39 and 5.14.

Significant differences were detected in three areas of language as assessed by the ITPA: the PLA or average language score, Auditory Reception and Visual-Motor Association. The significant differences for the PLA were between Groups I and III (adjusted means 78.03 and 93.73) and Groups II and III (adjusted means 82.79 and 93.73). For Auditory Reception the significant differences were between Groups I and II (adjusted means 68.16 and 87.47) and Groups I and III (adjusted means 68.16 and 103.6). For Visual-Motor Association the significant differences were between Groups I and III (adjusted means 76.65 and 106.99) and Groups II and III (adjusted means 88.19 and 106.99).

The comparison for two pairs of means was significant for the Vineland Social Maturity Scale. Groups I and II, and Groups II and III differed significantly on Social Age where the adjusted means were 100.01 and 123.39, and 96.85 and 123.39 respectively.

Finally, there were significant differences for Groups I and III, and Groups II and III for one subtest of the diagnostic number test, computational skills. The adjusted means were 3.87, 5.83 and 13.76 for Groups I, II and III respectively.

In summary, there were significant overall effects detected for 10 variables, and 18 of the 30 comparisons between pairs of means were significant at the .05 level. The comparisons between Groups I and II were significant for the average gain in stage of development for the measurement of length test and the localization of topographical positions test, the number of subjects where dominance became established and the Auditory Reception subtest of the ITPA. All differences favored Group II, the 8 to 11 year group. There were significant differences between Group I and III on the tests, measurements of length, Body Image, localization of topographical positions, left-right opposition, the average language score on the ITPA and ITPA subtests, Auditory Reception and Visual-Motor Association, Vineland Social Age and arithmetic computational skills. All differences favored Group III. Groups II and III differed significantly on the comparisons for the left-right opposition test, the PLA score and Visual-Motor Association subtest, Vineland Social Age and arithmetic computational skills. Differences favored Group III.

PART 3: CONCLUSIONS

CHAPTER XI

PSYCHOEDUCATIONAL MEASURES: A CRITIQUE

Many tests, both descriptive and psychoeducational, were administered in the present study. The large number of tests administered can be justified only on the grounds that the study was exploratory and they were used for research purposes. It would be impossible to administer a test battery of this magnitude in the school system, furthermore, such an elaborate test battery is not necessary.

One of the purposes of the study was to determine patterns of strengths and deficits, as well as the tests which appear to be adequately assessing particular areas of functioning. Based on experience gained in the study, a test battery is proposed for teachers and consultants in Special Education.

Several factors were considered in selecting the test battery. (1) A review of the correlation coefficients computed for the test scores indicates the tests are related significantly to each other and to achievement. (2) Based on clinical experience, the test(s) proposed appear to be assessing the particular areas of development. (3) Reported research indicates at least tentatively, that the tests are valid for assessing the areas indicated. (4) If prescriptive teaching is to become a viable approach in Special Education, teachers will have to be able to administer a fair number of the tests required for each child, and also to become fairly sophisticated in test interpretation. For this reason, whenever possible tests which can be administered by teachers are proposed.

The proposed test battery is in outline form. Preceding the outline brief comments are presented concerning the tests used and why particular tests or subtests are included or deleted. A test battery will of course vary from one child to another depending upon his/her disabilities. One further point should be made. While the author and the project directors are agreed that testing is necessary and valuable, they also agree that testing should be kept to a minimum. There are several reasons for this conclusion. In the first place, teachers (even when they have received a substantial degree of training in test administration) tend to be hesitant about administering tests. The notion of the teacher as a "gatherer" of information normally considered to be primarily in the psychologist's domain is a relatively new concept. Teachers tend to want the psychologist to be responsible for test administration. Secondly, teachers are busy people. The more streamlined the test battery, the more efficient and effective a teacher can be.

In keeping with these two considerations, an observation checklist has been developed. Recent experience in using the checklist indicates that a great deal of testing can be eliminated altogether, if teachers become adept at observing behaviors. The author has found that educational programming directly from observation is a feasible approach. The checklist of behaviors is included.

Conclusions: A Review of the Test Battery

I. Tests of Intellectual Ability:

Two standardized intelligence tests were administered, the Stanford Binet and the WISC. It is not the tests themselves but the manner in which they are used which appears to be relevant. Presenting IQ scores to a teacher is at best of doubtful value. There are studies reported in the literature concerning the manner in which groups of scores tend to cluster together to form patterns.

The patterns have been discussed in an earlier chapter. It has been the author's experience that teachers can become very able in interpreting and utilizing this type of information. It is suggested, therefore, that interpretation of test scores be presented to teachers in the format discussed earlier.

There is an ever growing body of research concerning the relevance of Piagetian theory for education. There appears to be little doubt that logico-mathematical concepts as assessed by Piagetian tasks, are prerequisites for academic learning. Skill in Piaget's clinical method of assessment can be acquired by teachers in basic undergraduate teacher education programs. It is concluded that the six tasks administered in the present study are a valuable addition to a psychoeducational test battery.

II. Tests of Language Development:

The ITPA proved a valuable assessment tool in the present study, however, it is not recommended that the test be administered to all exceptional children, nor that the entire test be administered when it appears relevant to include that test in the battery. There appear to be several patterns of language ability-disability. Close observation of the child's language behavior will indicate the areas of deficit. Selection and administration of relevant subtests will make use of the ITPA more efficient and effective.

Very few children in the present study had a deficit in auditory discrimination per se, however, when there was such a deficit, the Wepman Test of Auditory Discrimination proved valuable. The Wepman test has the added advantage that it can be administered by a teacher and requires very little testing time.

The Peabody Picture Vocabulary Test was administered to all children in the present study. It was not always necessary to do so. The PPVT (as are most other picture vocabulary tests) is useful in assessing vocabulary comprehension and load when it appears the child has a vocabulary deficit, and should therefore be used selectively.

III. Tests of Perceptual-Motor Development:

The perceptual-motor battery included the largest number of tests. The Purdue Perceptual-Motor Survey appears to have many advantages as a psycho-educational measure. It is unfortunate that the test is not standardized. Of the five subtests, disabilities were found more often for Perceptual-Motor Match, Form Perception and Body Image and Differentiation. Where motor problems are present of the type assessed in the Balance and Posture subtest, they can readily be detected by the alert teacher without administering the subtest. The implications for disability in Ocular Control are rather fuzzy. If there appear to be problems in this area, it is recommended that the child be referred to the reading specialist for a telebinocular test and/or to the Ophthalmologist with a description of the types of problems suspected.

Not all children will require all of the remaining three subtests administered. They should be administered only when in observing the child, there appear to be specific problems in these areas.

Only two subtests of the Frostig DTVP occurred with any regularity to measure areas of deficit and/or correlated with any other variables, including achievement. They were the Figure Ground and Form Constancy subtests. The Eye-Motor Coordination and Spatial Relations subtests were related significantly to almost no other variables. This was true also, but to a lesser degree, of the Position in Space subtest, furthermore, this subtest seems to be assessing the ability to discriminate visual detail and to be related to reversing and rotating numbers and letters. When this is a problem area, it is readily observable and it seems a waste of time to verify the obvious. It is recommended, therefore, that the Frostig DTVP subtests be used selectively and only when observation indicates their use is relevant.

Three tests of representational space were administered. One test, the Concept of Opposition of Left and Right, is undoubtedly of value as a psychoeducational measure. The test can be administered by a teacher in under ten minutes and indicates specifically where the child is in his development of the concept. The Localization of Topographical Positions test appears to be relevant for some type(s) of reading disabilities, however, the nature of the relationship is not clear at this point. It is recommended, therefore, that the test has value for research purposes only at this time.

It is not recommended that the third test, Coordination of Perspectives, be used as an assessment measure at this time. It is difficult to administer and interpret and its relationship to learning disorders is not clear.

Because so little is known about the relevance of lateral dominance as a function of school performance, there seems to be little point in including a test of lateral dominance in a psychoeducational test battery.

The Goodenough-Harris Draw-A-Man test also appears to have value as a psychoeducational measure. Combined with the Body Image and Differentiation subtest from the Purdue, the two tests provide the teacher with information on the child's knowledge of his body and its parts. Gaining body knowledge appears to be a basic part of motor development. The test is simple to administer and score and requires little testing time.

Although the Bender Visual-Motor Gestalt test scores were confusing, the test also has an important place in the psychoeducational test battery. The test appears to be measuring visual-motor integration and to be very sensitive to one of the basic problems involved in severe arithmetic disability. While the test results are difficult to interpret, an interpretation of the factors relevant to visual-motor integration is very valuable for the teacher in understanding the nature of the problem.

IV. Tests of Social Development:

While the California Test of Personality had research value, there appears to be little reason for including the test in a psychoeducational test battery. On the other hand, the Vineland Social Maturity Scale appears to be a very valuable measure of social skills for children under nine or ten years of age. Furthermore, the scale can be administered and interpreted by the teacher, and can be used to indicate the sequence in which children generally acquire social skills. The scale, therefore, has value both for assessment and curriculum development.

The Piagetian task, Coordination of Perspectives, does not appear to have value except for research purposes at the present time. The Activity Level Checklist does appear to have considerable value. The terms hyperactivity and

hypoactivity are nebulous and are ill-defined by most teachers. The checklist forces the teacher to think about the relevant behaviors objectively and separates the normally active child from the truly hyperactive child. The checklist also pinpoints the areas in which the child is hyperactive.

V. Tests of Academic Development:

The Stanford Achievement test was used as a general measure of achievement. As such, the test is valuable for screening purposes but other general achievement tests may be used for the same purpose. The diagnostic achievement tests are extremely valuable for determining the exact areas of academic difficulty. The teacher can and should use the diagnostic tests. While time consuming to administer, the information provided by the tests makes remediation more effective and efficient. The two diagnostic tests administered in the present study were the arithmetic test designed by the author and the Doren Diagnostic Reading test.

The Metropolitan Readiness test was administered to determine whether children with no measureable academic skills were ready for academic instruction. Readiness tests also are valuable for the non-academic child, if used for diagnostic purposes. Children with learning problems tend to have splintered performance on the readiness tests, and the profile can be indicative of areas of serious deficit. The Metropolitan Readiness test, apart from the two subtests on Word Meaning and Listening, measures primarily visual, copying and number skills. The author has since used the Gates-McGinitie Readiness test extensively. By combining the tests of auditory content from the latter and the tests of visual content from the former, the teacher has a good screening measure for many of the deficits common to learning disorders. The copying subtests are useful as measures of visual-motor integration and/or form recognition. The Number subtest from the Metropolitan is a valuable screening test for children who are high risk for serious disabilities in arithmetic.

VI. Observing the Child: A Checklist for Special Education

As indicated earlier, from experience gained in the study the author has designed a checklist to assist the teacher in structuring observation of the child. The checklist has proved valuable as: (1) a screening device to eliminate unnecessary testing; (2) a source of information for educational programming. In the beginning, the checklist probably has more value as a procedure for determining areas where testing seems to be required, however, as the teacher becomes more experienced and confident in detecting problem behaviors, the checklist can be used directly for programming with a minimum of testing.

Each behavior cited in the checklist should be rated for the frequency with which it occurs. The rating scale is from 1 (the behavior never occurs) to 5 (the behavior is almost always present). Once the teacher has noted the behaviors which are present, a summary profile should be completed. The summary profile is presented following the checklist.

Finally, when the teacher has isolated the behaviors which appear to be basic to the problem(s) the child is manifesting in academic functioning and/or adjustment, he/she is ready to select the test battery for the individual child. An outline of tests or subtests hypothesized to be measuring the areas of deficit is presented in the final section of the chapter.

CHECKLIST FOR SPECIAL EDUCATION

Observation period: from _____ to _____ Observer _____

Child _____ Sex _____ Date of Birth: Day _____ Month _____ Year _____

School _____ Teacher _____ Grade _____

Instructions: For each item in the checklist, rate the child being observed by circling the appropriate category indicating the frequency with which the behavior is seen, on the following scale: 1) never, 2) rarely, 3) occasionally, 4) frequently, 5) always.

PART ONE: TEMPORAL-SPATIAL DISABILITIES

*Specific
Area of
Disability*

*Behavioral and/or Academic
Manifestation of the Disability*

Scale

1. Motor Disability

A. Gross Motor Problems:

1) Balance and Coordination

- Bumps into objects
- Trips over self
- Bumps into others
- Has difficulty with games requiring hopping and/or balance on one foot, e.g. hopscotch
- Has difficulty skipping, running, jumping rope, etc.
- Has difficulty using both sides of the body simultaneously or individually

1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5

*Specific
Area of
Disability*

*Behavioral and/or Academic
Manifestation of the Disability*

Scale

	Generally clumsy and uncoordinated	1 2 3 4 5
	Must concentrate on body movement to the detriment of the task to be learned	1 2 3 4 5
2) Body Image	Has difficulty locating different parts of the body when asked to do so	1 2 3 4 5
	Makes distortions in the Draw-A-Man test	1 2 3 4 5
3) Spatial Relationships	Has difficulty judging distances in relation to himself	1 2 3 4 5
	Moves defensively or closes his eyes when an object such as a ball is moving towards him	1 2 3 4 5
	Has problems in dressing, e.g. clothes are put on backwards or inside out, shoes are placed on the wrong feet, buttons in wrong holes	1 2 3 4 5
	Becomes lost when going to and from school or when sent to another classroom	1 2 3 4 5
	Lateral dominance is inconsistent	1 2 3 4 5
	Has problems with directionality	1 2 3 4 5
	Has difficulty telling time or pacing himself when performing tasks; completing tasks in allotted time	1 2 3 4 5
	Is late for school, bus, coming in for recess, etc.	1 2 3 4 5
	Has difficulty organizing the steps in a task in a logical sequence	1 2 3 4 5
	Has difficulty with academic subjects such as numbers in columns are misplaced	1 2 3 4 5
	Counting concepts involving words that denote space are not understood, e.g. before, after, between, in front of, beside	1 2 3 4 5
4) Body Midline Problems	Avoids crossing body midline with the hand	1 2 3 4 5
	Walks along as he writes on blackboard, rather than extend the hand and arm	1 2 3 4 5
	Cannot locate left and right on a person or an object placed opposite (this ability normally develops in children between 8 and 10 years)	1 2 3 4 5
	Has difficulty copying movements from top to bottom	1 2 3 4 5
	Starts writing in the middle of the paper	1 2 3 4 5
	Starts writing at the left margin but does not go beyond <i>end-point</i>	1 2 3 4 5

*Specific
Area of
Disability*

*Behavioral and/or Academic
Manifestation of the Disability*

Scale

*B. Fine Motor
Problems:*

Has difficulty with tasks requiring grasping
Has difficulty coordinating the first finger and thumb
Has difficulty cutting, pasting, etc.
Has difficulty holding crayon and pencil effectively
Handwriting is poor
Has difficulty tying shoelaces, buttoning buttons
Clumsy with tools

1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5

C. Motor Praxis:

1) Ocular Control

Excessive head movement when scanning
Has difficulty focusing visually
Has difficulty shifting focus from one object to another in the classroom
Head is tilted in an unusual fashion when doing close work
Eye movements when reading are jerky
Has difficulty participating in "tracking" games
Has difficulty making adjustment from seat to board work

1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5

2) Fingers

Has right-left disorientation problems
Cannot name or locate the finger of either hand
Has difficulty using the fingers for counting

1 2 3 4 5
1 2 3 4 5
1 2 3 4 5

D. Rhythm:

Has difficulty with activities requiring rhythm, e.g. marching games, rhythm band

1 2 3 4 5

**Specific
Area of
Disability**

**Behavioral and/or Academic
Manifestation of the Disability**

Scale

**II. Visual-Motor
Integration Disability**

**A. Eye-Motor
Coordination:**

Has difficulty staying within lines when coloring or writing.
In arithmetic computation, columns are incorrectly aligned horizontally and/or vertically
Easily loses place when reading

1 2 3 4 5
1 2 3 4 5
1 2 3 4 5

B. Form Reproduction:

Cannot perform with blocks and other toys requiring manipulation
May be able to discriminate among geometric forms and letters but is unable to use a pencil or crayon to reproduce them
Poor quality in written work, poor handwriting--illegible; malformed letters; runs words or parts of words together in copying
Cannot copy arithmetic problems correctly and is therefore unable to add, subtract, etc.
Poor written reproduction is also manifested as an inability to spell

1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5

**III. Visual Perception
Disabilities**

A. Position in Space:

Continues to mirror, reverse and/or rotate letters, numbers, words or other forms in both reading and copying after age eight

1 2 3 4 5

B. Figure Ground:

Has difficulty attending to task
Distracted by extraneous visual stimuli
Seldom finishes his work
Becomes very confused when a page contains a great deal of writing
Written work is disorganized
Poor word recognition
Has difficulty recognizing figures when one is presented within another

1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5

*Specific
Area of
Disability*

*Behavioral and/or Academic
Manifestation of the Disability*

Scale

C. <i>Visual Closure:</i>	Is excessively slow in visual work and frequently does not complete assignments	1 2 3 4 5
	Studies pictures or words for a long time	1 2 3 4 5
	Does not derive information from partial visual clues, sketches or pictures drawn from stick figures	1 2 3 4 5
	Has difficulty doing puzzles with more than ten pieces	1 2 3 4 5
	Has difficulty understanding dot-to-dot drawings	1 2 3 4 5
	Has difficulty blending letters into words visually	1 2 3 4 5
	Has difficulty understanding letters printed in a style differing from that generally used	1 2 3 4 5
	Relationships between letters such as m and n are not seen	1 2 3 4 5
D. <i>Form Perception:</i>	Has difficulty putting scrambled letters together to form a word, even though the whole word is known	1 2 3 4 5
	Has difficulty in matching shapes, letters, etc.	1 2 3 4 5
	Arithmetic disability: Seems unable to benefit from manipulation of concrete material; confuses signs such as +, -, x, ÷, but may be able to perform the operation when he is told the sign	1 2 3 4 5
	Reading disability: Unable to discriminate letters or use configuration as a word attack skill	1 2 3 4 5
	Has difficulty discriminating similar words such as pen, pin	1 2 3 4 5
	Has difficulty recognizing the upper and lower case forms of letters, or distinguishing among letters composed of the same elements, e.g. V, W	1 2 3 4 5
	Uses a mixture of upper and lower case letters when writing	1 2 3 4 5
	Pays no attention to punctuation	1 2 3 4 5
	Recognizes a word in one context but not when it is used in a new situation	1 2 3 4 5

**Specific
Area of
Disability**

**Behavioral and/or Academic
Manifestation of the Disability**

Scale

PART TWO: MEMORY/SEQUENCING DISABILITIES

**I. Visual Memory and
Sequencing**

A. Memory:

- | | |
|--|-----------|
| Has difficulty remembering what he has seen or has been shown | 1 2 3 4 5 |
| Cannot visualize symbols in his "mind", although he may recognize the symbol when it is presented to him | 1 2 3 4 5 |
| Cannot remember how to spell his name | 1 2 3 4 5 |
| Has difficulty acquiring a sight vocabulary | 1 2 3 4 5 |
| When writing from copy, must make a letter for letter match rather than writing whole words | 1 2 3 4 5 |

B. Sequencing:

- | | |
|--|-----------|
| Remembers the letters in a word but gets them in the wrong order, e.g. tlod or told, cta for cat | 1 2 3 4 5 |
| Remembers the events in a story, film, etc., but not the sequence | 1 2 3 4 5 |
| Cannot participate in games involving a sequence | 1 2 3 4 5 |
| Cannot remember sequences such as landmarks between his home and a school | 1 2 3 4 5 |
| Counting is incorrectly sequenced | 1 2 3 4 5 |
| Confuses sequences in tasks such as the order in which to dress | 1 2 3 4 5 |
| Confuses sequences in tasks in art, physical education, etc. | 1 2 3 4 5 |

**II. Auditory Memory and
Sequencing**

A. Memory:

- | | |
|---|-----------|
| Cannot count by rote | 1 2 3 4 5 |
| Does not remember his address, telephone number, etc. | 1 2 3 4 5 |
| Does not know general information such as days of the week, months and seasons of the years | 1 2 3 4 5 |
| Oral recall for spelling is poor | 1 2 3 4 5 |
| Oral recall for arithmetic combinations is poor | 1 2 3 4 5 |
| Cannot memorize poems, songs, etc. | 1 2 3 4 5 |
| Cannot remember oral directions | 1 2 3 4 5 |
| Cannot remember experiences in the immediate past | 1 2 3 4 5 |
| Cannot recall the names of letters, objects, sounds made by common objects | 1 2 3 4 5 |

*Specific
Area of
Disability*

*Behavioral and/or Academic
Manifestation of the Disability*

Scale

	Has difficulty retrieving words for use in speaking	1 2 3 4 5
	Substitutes gestures or descriptive phrases for words he cannot recall or to make wants known	1 2 3 4 5
	Recognizes words but cannot retrieve them from memory	1 2 3 4 5
B. Sequencing	Knows days of the week, etc., but cannot recall the sequence	1 2 3 4 5
	Reverses word order when reading	1 2 3 4 5
	Transposes sounds in words, e.g. spaghetti for spaggetti	1 2 3 4 5
	May remember oral directions but not their sequence	1 2 3 4 5
	Sequences sounds or syllables oddly	1 2 3 4 5

PART THREE: LANGUAGE DISABILITIES

*I. Receptive and Expressive
Language*

A. Auditory Reception:

Seems to be less intelligent than IQ tests indicate	1 2 3 4 5
Can "do" more things than you would expect, e.g. put puzzles together, use abacus for computation	1 2 3 4 5
Watches teacher's face intently trying to lip read	1 2 3 4 5
Is inattentive when oral presentations are being made by other children	1 2 3 4 5
Does not listen to conversations between adults or adults and children	1 2 3 4 5
Has difficulty abstracting what is funny, silly	1 2 3 4 5
Has difficulty understanding abstract words but may have a good "concrete" vocabulary	1 2 3 4 5
Has difficulty describing differences and similarities	1 2 3 4 5
Cannot carry out directions given orally by teacher or on tape recorder, etc.	1 2 3 4 5
Follows instructions better after being shown rather than told	1 2 3 4 5
Has difficulty with reading comprehension exercises and/or answering questions from stories read to him	1 2 3 4 5
Likes to look at "picture" books but does not like to have stories read	1 2 3 4 5
Can solve arithmetic problems presented in written form but not from oral presentation	1 2 3 4 5

*Specific
Area of
Disability*

*Behavioral and/or Academic
Manifestation of the Disability*

Scale

B. <i>Vocal Expression:</i>	Seems shy, rarely talks in class	1 2 3 4 5
	Responds in one word sentences	1 2 3 4 5
	Defines and/or uses words concretely, that is, by characteristic or use rather than by classification	1 2 3 4 5
	Raises hand but gives a foolish answer	1 2 3 4 5
	Talks a lot but expresses few ideas	1 2 3 4 5
	Has difficulty expressing himself in complete sentences	1 2 3 4 5
	Written expression is poor	1 2 3 4 5
	Silent reading may be better than oral reading	1 2 3 4 5
	May do better with written arithmetic computation than with oral	1 2 3 4 5
C. <i>Visual Reception:</i>	Has difficulty participating in choral work	1 2 3 4 5
	Does not get enjoyment from looking at picture books	1 2 3 4 5
	Does not get information from pictures, e.g. does not see what is funny in a picture	1 2 3 4 5
	Does not seem aware of visual clues in tasks such as finding his way about the school, or to and from school	1 2 3 4 5
	Does not seem aware that things are wrong, e.g. that clothes are inside out	1 2 3 4 5
	Seems unaware of visual differences and similarities	1 2 3 4 5
	Has difficulty making comparisons involving visual information, e.g. differences in size, distance, shape, etc.	1 2 3 4 5
	Performs better when he has been told, rather than shown	1 2 3 4 5
	Has difficulty making social judgments involving non-verbal relationships	1 2 3 4 5
D. <i>Motor Expression:</i>	General inability to express himself manually, e.g. imitation of movements or demonstration of how simple objects are used; pantomime; charades; finger play	1 2 3 4 5
	May have difficulties with fine and/or gross motor coordination	1 2 3 4 5
	Unable to draw the human figure	1 2 3 4 5
	Unable to combine a sequence of movements	1 2 3 4 5
	Clumsy and awkward, manifests many of the characteristics described under motor disabilities	1 2 3 4 5
	Tends to avoid group activity, particularly in the playground	1 2 3 4 5

*Specific
Area of
Disability*

*Behavioral and/or Academic
Manifestation of the Disability*

Scale

	Tends to be easily discouraged when asked to produce written work	1 2 3 4 5
	Gives the appearance of being tense when asked to produce written work	1 2 3 4 5
II. <i>Inner-Language Disorders</i>	Does not participate in imaginative play, e.g. playing store, house, etc.	1 2 3 4 5
	Does not generate imaginative and creative play, at work, written stories, oral stories, etc.	1 2 3 4 5
	Does not play with toys which require him to build e.g. construction blocks	1 2 3 4 5
	Cannot understand rules for playing games	1 2 3 4 5
	Has difficulty with riddles or guessing games	1 2 3 4 5
	Story telling is incoherent	1 2 3 4 5
	Does not understand why or how things happen	1 2 3 4 5
	Has difficulty understanding relationships whether complex such as family relationships, or simple such as why objects belong together	1 2 3 4 5
	Has difficulty giving opposites, making classifications, telling how things go together, etc.	1 2 3 4 5
	In reading readiness activities he is unable to detect the distractor which belongs or does not belong	1 2 3 4 5
	Meaningful sequences are not understood	1 2 3 4 5
III. <i>Grammar and Syntax</i>	Sentence structure is simple and lacking in variety	1 2 3 4 5
	Sentences are short	1 2 3 4 5
	Words are omitted and/or order is distorted	1 2 3 4 5
	Uses telegraphic speech, e.g. Mommy - Daddy - Billy - go - picnic	1 2 3 4 5
	"Dodges" words, e.g. here is a child, here are two _____ (kids)	1 2 3 4 5
	Uses possessives incorrectly, e.g. This is mine doll.	1 2 3 4 5
	Uses pronouns incorrectly, e.g. Me do that.	1 2 3 4 5
	Uses plurals incorrectly, e.g. womans, knives, sheeps	1 2 3 4 5
	Uses verb tenses incorrectly, e.g. I done my work	1 2 3 4 5

*Specific
Area of
Disability*

*Behavioral and/or Academic
Manifestation of the Disability*

Scale

	Uses incorrect verb tense forms, e.g. I runned.	1 2 3 4 5
	Asks questions (correct information) but does not use question sentence structure	1 2 3 4 5
	Does not use correct verb endings for past and progressive tenses	1 2 3 4 5
	Uses negatives incorrectly, e.g. I not do that.	1 2 3 4 5
	Uses comparatives incorrectly, e.g. This is gooder.	1 2 3 4 5
	Confuses prepositions, e.g. in for on	1 2 3 4 5
 IV <i>Auditory Imperception</i>		
A. <i>Discrimination.</i>	Cannot discriminate between gross sounds, e.g. car noise and telephone noise	1 2 3 4 5
	Cannot discriminate fine differences in everyday sounds, e.g. telephone bell and doorbell	1 2 3 4 5
	Cannot discriminate fine differences in words, e.g.	
	initial consonants	1 2 3 4 5
	short vowels	1 2 3 4 5
	long vowels	1 2 3 4 5
	Confuses words which sound similar	1 2 3 4 5
	Has difficulty with pitch, intensity, frequency	1 2 3 4 5
	In general, has difficulty using phonics for	
	spelling	1 2 3 4 5
	word analysis	1 2 3 4 5
B. <i>Closure and Figure Ground</i>	Easily distracted by competing auditory stimuli	1 2 3 4 5
	Cannot concentrate when there is a noisy background, e.g. street noises, other children are noisy	1 2 3 4 5
	Cannot locate the source of sound	1 2 3 4 5
	Has difficulty recognizing voices	1 2 3 4 5
	Has difficulty understanding people with different accents	1 2 3 4 5
	Has difficulty understanding material with static in the background, e.g. a noisy tape	1 2 3 4 5

*Specific
Area of
Disability*

*Behavioral and/or Academic
Manifestation of the Disability*

Scale

Manifests hyperactive, distractible behavior
Focuses attention everywhere but on his own work

1 2 3 4 5
1 2 3 4 5

C. Blending

Cannot make use of phonetic clues
Has difficulty with rhyming words
Cannot blend sounds into syllables and words
In general, has difficulty acquiring phonic skills

1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5

PART FOUR: ATTENTION RELATED DISORDERS

I. Distractibility

A. Meticulosity

Produces work which varies in quality
Cannot begin to work until everything is in a specific place
Turns in papers that are dirty
Erases frequently

1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5

B. Perseveration

Has difficulty shifting from one task to another
Attends for inappropriately long period to a visual stimulus
Attends for inappropriately long period to a sound
Continues an activity after it is appropriate, e.g. continues counting after the number of objects to be counted is exhausted
Repeats a word over and over
Repeats an incorrect response, even after several corrections
In arithmetic adds (or subtracts) all problems even though he can distinguish operator signs and may know both processes
Recognizes an error, erases it and repeats the error

1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5

*Specific
Area of
Disability*

*Behavioral and/or Academic
Manifestation of the Disability*

Scale

<i>C. Distractibility</i>	Has short attention span, that is, cannot stay occupied with one activity for more than a few minutes	1 2 3 4 5
	Distracted by extraneous visual stimuli	1 2 3 4 5
	Cannot keep his hands off objects not relevant to the task at hand	1 2 3 4 5
	Compulsively attracted to non-essential details, rather than the total activity	1 2 3 4 5
	Responds to directions being given to other children, e.g. children in another reading group	1 2 3 4 5
	Has difficulty sitting still	1 2 3 4 5
	Has difficulty standing still	1 2 3 4 5
	Wanders off while being spoken to or instructed	1 2 3 4 5
<i>II. Hyperactivity</i>		
<i>A. Motor or Skeletal Hyperactivity</i>	Excessive restlessness, e.g. makes tapping, scuffing noises with fingers and/or feet	1 2 3 4 5
	Inattentive, i.e., he is unable to maintain attention	1 2 3 4 5
	Short interest span	1 2 3 4 5
	Has difficulty modulating activity level, particularly when expected to perform an abstract academic task	1 2 3 4 5
	Unable to persist at an abstract task	1 2 3 4 5
	Excessively active in situations requiring motor inhibition	1 2 3 4 5
	Leaves seat constantly to wander around the classroom	1 2 3 4 5
	Remains in seat but fidgets constantly	1 2 3 4 5
	Frequent misconduct, particularly in the classroom	1 2 3 4 5
<i>B. Impulsivity</i>	Goes headlong into tasks without stopping to think	1 2 3 4 5
	Darts from one activity to another without forethought	1 2 3 4 5

*Specific
Area of
Disability*

*Behavioral and/or Academic
Manifestation of the Disability*

Scale

C. Disinhibition:

- Cannot stop or control himself
- Low tolerance for frustration
- Attention to things in the present is disrupted by thoughts of past experience or future anticipation
- Attention is fleeting
- Sensitive to stress and often anxious, particularly when doing academic tasks
- Gives inappropriate or unrelated answers
- Disturbs others, often gets into fights
- Speaks out of turn
- Frequent temper outbursts, tantrums

1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5

PART FIVE: SENSORY ACUITY DISABILITIES

I. Auditory Acuity

- Seems not to pay attention when the teacher is speaking
- Does not hear information presented over the P.A. system
- Cannot hear when the speaker's face is hidden
- Consistently turns his head towards speaker trying to hear
- May cup his ear trying to hear
- Cannot follow directions, asks for repetitions
- Asks to sit near the teacher's desk
- May be restless, behavior is poor
- May complain of ear aches

1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5

II. Visual Acuity

- Complains that he cannot see the blackboard
- Tires easily when doing visual work
- Holds book very close to or far away from his eyes, or in any other unusual fashion
- Blinking, redness, tearing, inflammation of eyes

1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5

SUMMARY PROFILE OF BEHAVIORS

Directions: For each area of disability included in the checklist and summary profile, a number of behaviors hypothesized to be reflecting a disability in the area have been listed. The behaviors have been rated on a scale from 1 to 5: (1) the behavior never occurs, (2) rarely occurs, (3) occasionally occurs, (4) frequently occurs, and (5) is almost always present. If a child manifests several of the behaviors in an area, and if the behaviors occur frequently or are almost always present, circle the number on the scale in the area where the behaviors occur. Note only the areas of deficit. In this way, areas of disability will be readily apparent.

Area of Disability

Scale

Spatial-Temporal Disabilities:

I. Motor disability:

A. Gross motor problems:

- (1) Balance and coordination
- (2) Body image
- (3) Spatial relationships
- (4) Body midline problems

1 2 3 4 5
1 2 3 4 5
1 2 3 4 5
1 2 3 4 5

B. Fine motor problems:

1 2 3 4 5

C. Motor praxis:

- (1) Ocular control
- (2) Finger disabilities

1 2 3 4 5
1 2 3 4 5

D. Problems of rhythm :

1 2 3 4 5

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II. Visual-motor integration disability:

A. Eye-motor coordination

1 2 3 4 5

B. Form reproduction

1 2 3 4 5

III. Visual perception disabilities:

A. Position in space	1 2 3 4 5
B. Figure ground	1 2 3 4 5
C. Visual closure	1 2 3 4 5
D. Form perception	1 2 3 4 5

Memory-Sequencing Disabilities:

I. Visual memory and sequencing	1 2 3 4 5
II. Auditory memory and sequencing	1 2 3 4 5

Language Disabilities:

I. Receptive and expressive language:

A. Auditory reception	1 2 3 4 5
B. Vocal expression	1 2 3 4 5
C. Visual reception	1 2 3 4 5
D. Motor expression	1 2 3 4 5

II. Inner-language disorders	1 2 3 4 5
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III. Grammar and syntax	1 2 3 4 5
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IV. Auditory imperception:

A. Auditory discrimination	1 2 3 4 5
B. Auditory closure and figure ground	1 2 3 4 5
C. Blending	1 2 3 4 5

Attention Related Disorders:

I. Distractibility:

A. Meticulosity	1 2 3 4 5
B. Perseveration	1 2 3 4 5
C. Distractibility	1 2 3 4 5

II. Hyperactivity:

A. Motor hyperactivity	1 2 3 4 5
B. Impulsivity	1 2 3 4 5
C. Disinhibition	1 2 3 4 5

Sensory Acuity Disabilities:

I. Auditory acuity	1 2 3 4 5
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II. Visual acuity	1 2 3 4 5
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GUIDELINES FOR SELECTING THE TEST BATTERY

Gross Area of Disability

TEMPORAL-SPATIAL DISABILITIES

Specific Area of Disability

Tests Hypothesized to Assess the Disability

The Professional Who Normally Administers the Test

I. *Motor Disability*

A. *Gross Motor:*

- 1) Balance and Posture
- 2) Body Image
- 3) Spatial Relationships
- 4) Body Midline Problems

Purdue: Balance and Posture; Observation is generally sufficient

Teacher

Purdue: Body Image

Teacher

Observation is generally sufficient

Teacher

Purdue: Perceptual-Motor Match

Teacher

B. *Fine Motor:*

No specific test, observation is generally sufficient

Teacher

C. *Motor Praxis:*

- 1) Ocular Control

Purdue: Ocular Control
Telebinocular
Medical examination

Teacher
Reading Specialist
Ophthalmologist

- 2) Finger Disabilities

Test for finger agnosia & apraxia

Psychologist

D. *Rhythm:*

No specific test, observation is generally sufficient

Teacher

II. *Visual-Motor Integration Disability*

A. *Eye-Motor Coordination*

Frostig: Eye-Motor Coordination
WISC: Coding subtest

Teacher
Psychologist

B. *Form Reproduction:*

WISC: Block Design and Object Assembly
Bender Gestalt
For Younger Children: Purdue: Form Perception

Psychologist
Psychologist
Teacher

Copying subtest from the Metropolitan Readiness Test and
Visual-Motor Coordination Subtest from Gates McGinitie

Teacher

Gross Area of Disability

Specific Area of Disability

Tests Hypothesized to Assess the Disability

The Professional Who Normally Administers the Test

III. Visual Perception

A. Position in Space:

WISC: Picture Completion
Frostig: Position in Space
Observation is generally sufficient
For younger children: Matching or visual discrimination subtests on readiness tests
Frostig: Figure Ground

Psychologist
Teacher
Teacher
Teacher
Teacher

B. Figure Ground:

ITPA: Visual Closure

Psychologist

C. Visual Closure:

WISC: Block Design and Object Assembly
Frostig: Form Constancy

Psychologist
Teacher

D. Form Perception:

MEMORY/SEQUENCING DISABILITIES

I. Visual Memory and Sequencing

ITPA: Visual Sequential Memory

Psychologist

II. Auditory Memory and Sequencing

ITPA: Auditory Sequential Memory

Psychologist

LANGUAGE DISABILITIES

I. Receptive and Expressive Language

A. Auditory Reception:

ITPA: Auditory Reception
For younger children:
Metropolitan Word Meaning and Listening Subtests;
Gates-McGinities Listening Comprehension and Following Directions

Psychologist

Teacher

B. Vocal Expression:

ITPA: Vocal Expression

Psychologist

C. Visual Reception:

ITPA: Visual Reception
PPVT

Psychologist
Teacher

<i>Gross Area of Disability</i>	<i>Specific Area of Disability</i>	<i>Tests Hypothesized to Assess the Disability</i>	<i>The Professional Who Normally Administers the Test</i>
	D. Motor Expression:	ITPA: Manual Expression	Psychologist
	II. Inner-Language Disorders	ITPA: Auditory Vocal Association Visual-Motor Association WISC: Similarities	Psychologist Psychologist
	III. Grammar and Syntax	ITPA: Grammatic Closure	Psychologist
	IV. Auditory Imperception		
	A. Auditory Discrimination:	Wepman Test of Auditory Discrimination For younger children: Auditory Discrimination Subtest from Gates- McGinitie	Teacher Teacher
	B. Auditory Closure and Figure Ground:	ITPA: Auditory Closure	Psychologist
	C. Blending:	ITPA: Sound Blending For younger children: Gates- McGinitie subtest-Auditory Blending	Psychologist Teacher
ATTENTION RELATED DISORDERS	I. Distractibility	Observation	Teacher
	II. Hyperactivity	Activity Checklist	Teacher
SENSORY ACUITY	I. Auditory Acuity	Medical Examination	Audiologist
	II. Visual Acuity	Medical Examination	Ophthalmologist

CHAPTER XII

THE VALUE OF PRESCRIPTIVE TEACHING

The present study was an attempt to measure the efficacy of the prescriptive or diagnostic teaching model for the education of exceptional children. The results indicated that the approach does hold promise for meeting several objectives in Special Education but only after more data are made available through future research. Furthermore, the manner in which the model is usually applied is overly simplistic and of doubtful value. There is also some urgency in conducting research to "fill in" the gaps necessary if full potential of the model is to be realized. Educators tend to "throw out the baby with the wash water" before all the data are in. It would be unfortunate if this should happen with prescriptive teaching before its true value can be realized.

SUMMARY OF RESULTS

One objective of the study was to investigate the potential value of prescriptive teaching for ameliorating areas of deficit as detected with standardized tests commonly termed diagnostic or psychoeducational. A second objective was concerned with the potential value of prescriptive teaching for increasing functioning as measured in "transfer" in terms of increased scores in tests commonly termed classificatory or descriptive. The two objectives will be discussed separately.

I. Prescriptive Teaching: Its Effect on Psychoeducational Test Scores

Several categories of diagnostic or psychoeducational tests were administered to the subjects in the treatment groups to assess functioning in language, perceptual motor, social and academic development.

A. Language Tests

Three tests were administered to assess language functioning, the Illinois Test of Psycholinguistic Abilities (ITPA), the Wepman Test of Auditory Discrimination and the Peabody Picture Vocabulary Test (PPVT).

Thirty-nine scores were obtained from the ITPA data. Only one change was in a negative direction. Experimental Group II utilizing resource teachers to assist the special class teachers and including only children below nine years of age, made the greatest amount of gain in seven of the 12 subtests and in the average language score (PLA). Group III utilizing teacher aides to assist the special class teacher and including many of the children above eleven years of age, made the least amount of gain in seven of the 12 subtests and the average language score. For the 12 ITPA subtests, lowest gains occurred for the Auditory Sequential Memory and Vocal Expression subtests. Auditory Closure and Visual Sequential Memory appear to be most amenable to change with ten or more months of increase for two of the three experimental groups. Seventeen of a possible 39 mean scores increased more than seven months.

The three experimental groups made substantial gains in their ability to discriminate auditorially insofar as the ability is measured by the Wepman Test of Auditory Discrimination. The average PPVT Mental Age increased for the three C.A. groups but the gains were insufficient to increase PPVT mean IQ for one group, Group III. Small gains were made in mean IQ by Groups I and II. The PPVT was included in the test battery as a measure of receptive vocabulary.

When the subjects in the three experimental groups were divided into three C.A. groups and the variable of administrative grouping was disregarded, the three age groups made substantial gains on the ITPA. However, the average gain was greater for Group I (C.A. less than eight years) than for the older subjects. Group I made more than seven months of gain and Groups II and III made slightly less than seven months of gain.

Several interesting patterns of growth emerged when C.A. groups were compared. Auditory Sequential Memory increases were 0.7, 5.0 and 8.8 months for C.A. Groups I, II and III respectively, while average increases for Visual

Sequential Memory were 13.6, 10.6 and 2.7 months for Groups I, II and III respectively. It would appear that younger children may be using visual memory to a much greater extent than older children, with auditory memory becoming more important and visual memory less important as C.A. increases.

C.A. Groups I and II made substantial and approximately equal gains in Grammatic Closure and Auditory Closure, while Group III increased only slightly in these two areas. C.A. Group I made substantial gains in Sound Blending but Groups II and III made slight gains or decreased in this skill.

At the representational or meaningful level the amount of gain in Auditory Reception decreased as C.A. increased while gains in Visual Reception increased with increases in age. A similar pattern was found for the association subtests. Group I made the greatest gains in both Vocal and Motor Expression, however, the pattern of gain is less clear for the two older groups.

In summary, it would appear that language development as assessed by the ITPA and the Wepman can be increased through prescriptive teaching. With one exception, Auditory Sequential Memory, the greatest displacement in language learning rate at the automatic sequential level occurred for the youngest children.

It appears also that language functioning, at least at the representational level, can be increased by teaching global, developmental-type programs rather than teaching exercises designed around specific subtest content. In general, deficits as measured by ITPA representational level subtests were remediated through developmental programs such as the Peabody Language program. Training in phonics resulted in gains in Sound Blending, Auditory Closure and auditory discrimination. Programs designed for remediating visual-motor areas resulted in higher scores in visual language areas. The one exception may be sequential memory which was remediated directly. Finally, the patterns of growth indicate teaching sequential memory may be more productive if "normal" patterns of growth are followed.

B. Perceptual-Motor Tests

Four tests were administered to diagnose perceptual-motor skills: the Purdue Perceptual Motor Survey, the Harris Test of Lateral Dominance, two Piagetian tasks for representational space and the Frostig Developmental Test of Visual Perception (DTVP).

Only Experimental Group I made substantial gains in the abilities assessed by the Purdue and no group increased functioning to the normal range. Form Perception was the only subtest in which the three groups improved. Motor and perceptual-motor development received strong emphasis in the study but except for Group I children did not greatly improve their functioning in these areas as they are assessed by the Purdue. The reason may possibly be found in the types of programs administered. Commercial programs were used with the three groups. The program for Group I was supplemented with a "games" program built around deficits and strengths. Group I was the only group to show consistent improvement. It may be that motor programs to be successful should be presented through play.

When the gain scores for the Purdue were examined for each of the three age groups, Group III made the greatest gains and approached the top possible score of seven in all but the Balance and Posture and Form Perception subtests. Group III was also the only group to make positive gains in the five areas assessed by the test. Form Perception was the area of greatest impairment for the three age groups.

While the three experimental groups made gains in the five areas of visual perception supposedly measured by the Frostig DTVP, Group I made the largest gains in three areas and Group III made the least gains in the five subtests. Group II made greater gains than Group III in four of the five subtests. Mean scores on the DTVP subtests improved for the C.A. groups but the amount of gain decreased as the mean C.A. increased.

Experimental Groups I and II made progress towards establishing lateral dominance but Group III made little gain. When scores were considered by C.A. group, Groups II and III made only slight gains and Group I did not change. C.A. Groups I and III were very similar in spite of age differences. The number of children who established dominance was small, however, progress towards establishing dominance appears to have been made.

Two representational space tests devised by Laurendeau and Pinard (1970) were administered: the concept of opposition of left and right and localization of topographical positions. Gains for the three experimental groups were very slight for both tests. Stage of development also changed very little from one age level to the next.

In summary, only one experimental group improved substantially in motor and perceptual-motor functioning as measured by the Purdue, however, the oldest subjects made the greatest gains when subjects were grouped by age level. Two variables appear to be relevant in increasing functioning level, chronological age and the manner in which content is presented for remediation. Visual perception as assessed by the Frostig DTVP improved substantially. Only slight progress was made in establishing lateral dominance and it appears that emergence of lateral dominance is a fairly slow process in exceptional children and can be accelerated only moderately. Gains in stage of development in representational space were the least for any of the areas of spatial development.

C. Measures of Social Development

Two tests were administered to diagnose areas of social deficit. The subtests from the California Test of Personality were used to indicate general problem areas and a Piagetian test for stage of egocentricity, the Three Mountains Test, was administered to indicate overall stage of social development. Personal adjustment gains were largest for Experimental Groups I and II and both groups also made gains in social adjustment. Group III changed negatively in both areas. Individual attention and the degree of interaction with adults and peers appear to be the critical factors in increasing adjustment. The three C.A. groups made gains in personal adjustment which increased mean scores to the low average range of functioning. Only C.A. Group III functioned within the normal range in social adjustment but at posttest the average score decreased somewhat. The areas of personal

adjustment which appear most amenable to change are, Sense of Personal Freedom and Nervous Symptoms. No consistent pattern was found for the areas of social adjustment.

Small but positive gains were made by the three experimental groups in the test of egocentricity. C.A. Groups I and II made moderate gains in stage of development in the Three Mountains Test but C.A. Group III appeared to have fixated far below the level expected for both their M.A. and C.A. levels.

D. Measures of Academic Development

Diagnostic tests in reading and arithmetic were administered to pinpoint specific areas of disability. Only the diagnostic arithmetic test was readministered. Moderate but positive gains were made in each of the areas of arithmetic assessed.

Conclusions

In general it is concluded that prescriptive teaching was successful in improving functioning in language, perceptual-motor, social and academic development as these aspects of development are assessed by psychoeducational measures commonly used by Special Educators. However, the test scores did not increase in a simple one-to-one ratio of remedial exercise to area of deficit. The process appears to be far more complicated than the simplistic notions usually associated with prescriptive teaching. Many other variables are relevant and must be considered besides the teaching approach, for example, the child's cognitive style which seems to vary with the age of the child; the context in which content is presented; the degree and quality of child-adult, child-child interaction. Furthermore, more exact data must become available concerning basic prerequisite abilities required for learning more complex subject matter. Without these data prescriptive teaching could become nothing more than an administration of disjointed exercises which become the end, rather than the means to the end.

II. Prescriptive Teaching: Its Effect on Descriptive or Classifactory Test Scores

Several categories of descriptive or classifactory tests were administered to determine whether prescriptive teaching results in improved intellectual, perceptual-motor, social and academic functioning. The diagnostic tests were used directly in planning teaching programs. The descriptive tests were used as an indirect measure of development over the seven-month period. It was hypothesized that if prescriptive teaching did in fact displace rate of growth, the abilities measured directly by the diagnostic tests should transfer to more "neutral" measures of development, the descriptive tests. Descriptive tests were administered to both Experimental and Contrast Subjects.

Measures of intellectual, perceptual-motor, social and academic development were administered. Increases in language development were hypothesized to have occurred if verbal scores on IQ tests increased. Each area will be discussed separately.

A. Intellectual Development

Two approaches to measurement of intellectual development were used, intelligence as measured by standardized IQ tests (Stanford Binet and WISC) and logical thinking as measured by Piagetian tasks.

The Experimental Groups combined and Contrast Subjects made equal gains in IQ on the Stanford Binet, however, Experimental Group 1 made a substantial change and accounted for most of the gain for the Experimental Subjects. When Experimental Subjects were considered by C.A. group the youngest children (Group I) made the greatest gain in IQ while Groups II and III made moderate and equal gains.

WISC scores were examined in several ways, by verbal and performance IQ, by patterns of scores suggested by Bannatyne (1968), and by individual subtests. The Contrast Group decreased slightly but the Experimental Subjects made positive gains in both verbal and performance IQ. The mean gains in performance IQ were considerably higher than the mean gains in verbal IQ. While the three experimental groups increased in verbal IQ, Group I made the largest gain. Gains in performance IQ were substantial and similar for the three experimental groups. C.A. Groups I and III made substantial and approximately equal gains in verbal IQ, while Group II made a moderate gain. The same pattern was found for performance IQ but average gains for the three groups were higher than for verbal IQ.

Bannatyne (1968) suggested WISC results be considered in three ability patterns, conceptualization, spatial and sequencing. The Contrast Group maintained but did not increase their rate of growth in the spatial and sequencing patterns and decreased in the conceptualization pattern. The Experimental Groups combined increased in all three areas but only Group I increased in the three areas. For Group I the gains in the conceptualization pattern were slightly greater than the gains in the spatial and sequencing patterns. C.A. Group I made substantial gains in the three areas and Group III in spatial and conceptualization ability. C.A. Groups II and III made only slight gains in sequencing ability. Group II made the smallest gains in all three areas.

Generally, WISC performance subtest means increased more than the verbal subtest means. Gains in performance subtests were greater for Block Design and Object Assembly where mean scores increased to the normal range of functioning. The greatest increases in verbal ability were for the Comprehension and Similarities subtests, however, mean scores increased to the normal range for Similarities but remained in the E.M.R.—slow learner range for Comprehension.

According to Glasser and Zimmerman (1968) the Similarities subtest is a moderately good measure and Block Design an excellent measure of general intelligence. If this is so, the Experimental Subjects made significant gains in general intelligence. Glasser and Zimmerman also state that Block Design can be interpreted separately and in combination with Object Assembly as a specific measure of perceptual organization and spatial visualization ability. If their conclusions are accurate, the Experimental Subjects made significant gains in perceptual organization ability.

Gains in the remaining WISC subtests were minimal, however, Experimental Group I mean scores were increased for every subtest. Group II increased in all but two subtests, while Group III scores decreased for four subtests. The two younger C.A. groups made gains in all subtests except Arithmetic. C.A. Group III made gains in three verbal and four performance subtests but decreased slightly in the Arithmetic, Digit Span and Picture Completion subtests.

Two logical thinking tasks were administered, multiplication and inclusion of classes. The pattern of gains in both tasks was opposite to the pattern of gains for the WISC verbal and Stanford Binet IQ. Experimental Group I made the greatest gains in WISC verbal and Stanford Binet IQ and the least increase in stage of development in the classification tasks, while Group III made the least gains of the three groups in the two standardized verbal tests and the greatest gains for the two classification tests. C.A Groups I and II made comparable gains of one substage for both tasks.

Chronological age and IQ level may be two variables to study in determining how best to increase stage of development in logical thinking. Experimental Group III had the highest mean C.A. and WISC verbal IQ at pretest and a mean performance IQ comparable to the highest mean. However, one further possibility must be considered. A large number of the subjects in Experimental Group III (and who were also in C.A. Group III) were administered the Fletcher Mathematics program. The Fletcher program stresses use of concrete, manipulative, didactic teaching materials and discovery learning. Experimental Group I (where a majority of subjects were in the C.A. range 8-1 and 11-0) contained a majority of the hyperactive children. These children required a structured mathematics program and the Distar Math program was administered. It may be that the Fletcher program is more successful in developing logical thinking skills than the Distar program, however, it should also be noted that the hyperactive children were among the most severely disturbed and manifested a much higher incidence of deficits than the other children in the study.

Considering the classification tasks separately, the mean stage for C.A. Group I remained at the preoperational level in the ability, multiplication of classes. Group II initiated the concrete operational stage and the majority of subjects in Group III attained the stage of concrete operations.

The pattern of gains in the inclusion of classes test was similar, however, the three groups remained at the preoperational stage. The finding supports a conclusion by Whyte (1969) that in developing the ability to think logically, retarded children generally attain the concrete operational stage last in the inclusion of classes tasks, if indeed they ever do become operational in this ability. These observations point to the need for additional research. If prescriptive teaching is to fulfill its potential role in Special Education, much more data must be made available on the manner in which exceptional children develop. The author is convinced that only by following the developmental sequence for exceptional children, once we determine how the sequence compares and contrasts with "normal" development, can prescriptive teaching be used most efficiently.

Four other logico-mathematical tasks were administered. Very little gain was made by any experimental group in the conservation of length task, however, most subjects were operational at pretest. Apparently conservation in this area develops regardless of the type of educational experience provided. Very few of the Contrast Subjects were able to perform on the measurement of length task, a task which applies the ability to conserve length. The Experimental Subjects combined were at a slightly higher stage on the measurement task at pretest and made only minimal gains. Of the three experimental groups, Group I did not change and Groups II and III made minimal change. C.A. Group made only slight gains on the measurement task but Groups II and III gained one substage and one stage respectively.

For conservation of number results are ambiguous when considered by treatment group, however, C.A. Group I made substantial gain and a majority of subjects in C.A. Groups II and III were operational at pretest. On the seriation task there was no change in the mean score for the Contrast Group but the Experimental Subjects as a total group and as separate treatment groups increased one substage. However, no group became operational on the task. The three C.A. groups increased one to one-half substages on the seriation task but again no group developed to the stage of concrete operations on the task.

In general, the Experimental Subjects made greater gains in intellectual development than the Contrast Subjects. This was true for the standardized measures and the Piagetian tasks. Apparently prescriptive teaching can accelerate intellectual growth in exceptional children, at least over a seven-month period. The pattern of gain was opposite for the two types of tests. The finding is supportive of conclusions by DeVries (1970) that the Stanford Binet and the Piagetian tasks are assessing different intellectual factors. Other variables, however, may also influence the degree to which operational thought can be accelerated. Chronological age and IQ level at the beginning of the training period, the amount and quality of interaction with adults, the type of teaching programs used, level of hyperactivity and incidence and severity of additional deficits, all appear to be variables that must be studied before the most efficient program can be devised for acceleration in intellectual development.

General intelligence as measured by standardized tests increased but again the results are equivocal. Verbal intelligence, and presumably language ability, improved but to a lesser degree than nonverbal intelligence. Scores in nonverbal intelligence increased substantially and comparably for the three treatment groups. While gains in verbal intelligence appear to be dependent upon the quality and quantity of interaction with adults, nonverbal intelligence does not appear to be as dependent upon social interaction.

Similarities was the one WISC subtest where increases moved the three C.A. groups within the normal range of functioning. Similarities is thought to be a good measure of the ability to abstract by means of verbalization (Cohen, 1959). The Experimental Subjects at each age level increased in this ability, however, the youngest subjects made the greatest gains. It would appear the younger the subject, the greater is the possibility of displacing the rate of growth in a positive direction.

Even though the Experimental Subjects made gains in stage of development in the logico-mathematical tasks, the majority of subjects remained below the stage of concrete operations. Since concrete operations in the logico-mathematical concepts supposedly are prerequisites for understanding number systems and for learning to read, and since so few children attained the stage of concrete operations, presumably one can explain lack of substantial increases in academic achievement at least in part to deficits in concrete operational thought.

B. Perceptual-Motor Development

Scores on several of the psychoeducational tests administered to assess perceptual-motor development increased, presumably as a result of the prescriptive teaching program. However, two types of test scores changed only slightly or not at all, tests of representational space and the test for lateral dominance.

Two tests, the Draw-A-Man Test and the Bender Visual Motor Gestalt Test, were administered as descriptive tests of perceptual-motor development. The former was administered as a test for transfer of knowledge acquired about one's own body and indirectly as an assessment of the effectiveness of motor training. The latter was considered a measure of visual-motor integration. Since a detailed discussion is presented in Chapter VI, only the conclusions will be included at this point. Both Experimental and Contrast Subjects increased in average Draw-A-Man IQ scores but decreased in mean scores on the Bender Motor Gestalt Test.

In summary, the changes (as manifested by test scores) which occurred in the perceptual-motor areas are confusing and conflicting. If the results lead to any conclusion, it is simply that in spite of the great volume of research in this area we really have very little in the way of a unified theory which can explain the whole of spatial development. The area of spatial development more than any other requires research into the nature of how children in general and disabled children in particular develop spatial abilities, as well as the part played by spatial abilities in academic and social development.

C. Social Development

As stated earlier, the whole approach to social development in this study was naive in the extreme. Nevertheless several tentative conclusions can be stated.

Adjustment, both personal and social, is a complex matter and the result of many influences of which "schooling" is only one. It is therefore doubtful that any teaching approach will completely counteract other negative influences on a child's adjustment, particularly his social adjustment. Prescriptive teaching, if it is to have any value in improving adjustment, must be long term and have an opportunity to begin before the child has acquired a great number of negative feelings and failure avoiding patterns. By providing opportunities to be successful and feel worthwhile, the teaching program can contribute in building a positive self concept and reducing hostility to school. With one

group of children particularly, the children from eight to eleven years, a large proportion of the teaching time for the first several months had to be spent in building and/or improving attitudes and in changing patterns of failure avoiding to anything academic. Convincing children who have consistently failed in school tasks and social contacts that they can achieve and get along with others is a gigantic task.

Many exceptional children are desperately in need of opportunities to interact positively with adults. They have a need to be heard and to be convinced that they have something worthwhile to say. This was very evident in the way the children in Experimental Group I "opened up" to new situations and became outgoing rather than withdrawn. It appears to be what happens in the administrative setting, rather than the administrative setting *per se*, which is the relevant variable in bringing about change in the classroom. This was particularly true for social development.

Two areas of social development appear to have changed, supposedly because of the teaching program. Social skills increased and children learned to do more things for and by themselves. Hyperactivity decreased, supposedly because of the program. It would appear from the analysis of pretest scores by chronological age that hyperactivity tends to decrease with increased age regardless of the program, however, it is hypothesized tentatively that diagnostic teaching can accelerate the process.

In summary, social development consists of and is influenced by many factors. Prescriptive teaching appears to have value in modifying several aspects of social development but has very limited potential for modifying others.

D. Academic Development

Gains in academic achievement were moderate, however, the Experimental Subjects made higher gains than the Contrast Subjects in reading and arithmetic. Spelling gains were equal for both groups. The Experimental Subjects also made greater gains than the Contrast Subjects in readiness for reading and number.

Several factors were probably responsible for the moderate academic gains. At both pre and posttest the subjects in the study were functioning within the mentally retarded range of intelligence. One would, therefore, expect the rate of academic growth to be less than the rate expected of intellectually average children. Furthermore, it is generally accepted that the stage of concrete operations in logico-mathematical concepts is a prerequisite for achievement in reading and arithmetic. The majority of subjects in the study did not attain the concrete operational stage of functioning. Nevertheless, most subjects made moderate gains in academic areas. It is concluded, therefore, that prescriptive teaching has potential value for increasing academic skills and that the potential value will increase as better diagnostic tests are developed, more accurate data in development are accumulated and remedial programs and curricula become better sequenced and more effective.

OVERALL CONCLUSIONS OF THE STUDY

At the beginning of the study a number of questions were asked. An attempt will be made to answer the questions.

I. Areas Where Functioning Improved

Social development, except for social skills, appears to be the most difficult area to accelerate and social adjustment is more difficult to alter than personal adjustment. It could be argued, however, that in seven months any positive change could be considered significant considering the years the children have been in failure producing situations.

Academic areas increased but not at a "normal" rate, that is, month for month. Nevertheless, in many cases a regression trend was reversed and children did make fairly respectable progress for the short time under study.

Intellectual functioning was increased and in some cases accelerated, perhaps reversal of pseudo-retardation trends considering the negative changes made by the Contrast Group. Stage of development in the abilities tested in the Piagetian representational space tests and to a lesser extent, the logico-mathematical tasks, was difficult to increase. However, given more information and more relevant programming, there is tentative evidence growth in these areas can be accelerated.

As one would expect, most areas of remediation which were geared to tests (language, visual perception, etc.) increased. Furthermore, it is possible to bring about increase in these areas without using the commercial programs produced by the authors of the tests for remediation purposes. In fact, more imaginative and less structured programs produced more positive results.

II. Areas Where There Was Little Or No Measurable Change

1. Areas where prescribed programs for specific disabilities were followed, e.g. the Chaney and Kephart program for motor development produced little measurable change, however, there was evidence of some transfer of skills to other related areas.

2. Little transfer learning occurred from programs geared to rote learning e.g. when Distar programs were used for children requiring very structured programs.

3. Social development, particularly social adjustment was only minimally altered.

4. Vocabulary growth increased very little in tests designed to assess growth in this area, however, indirect evidence conflicts with these results.

5. There was almost no change in understanding of representational space as assessed by the Piagetian tasks.

There were other areas, already discussed, where change was erratic but the above were five of the most difficult areas in which to bring about change.

III. Categories Of Children Who Benefited Most From Prescriptive Teaching

From study of individual profiles it would appear the culturally deprived, the Educable Mentally Retarded and "slow learners" benefited relatively more than did other children. It is difficult to generalize with learning disabled children, although

children with visual-motor problems appeared to respond more readily to treatment than children with auditory problems. Two children with severe hearing loss made substantial progress in all areas. The one autistic child in the program made almost no progress and it is possible that this type of child might benefit more from a total behavior modification program, and probably out of the regular school and home background. Without exception the hyperactive children decreased in amount of hyperactive behavior and once this change occurred, learning became possible and the teaching program became effective. Overall, children did not make spectacular gains in social areas, however, the most impressive gains made by an individual child were made by a severely socially maladjusted youngster from a broken home and with the added complication of a moderate perceptual-motor disability. With an additional year in the special class to bring up academic skills he made a successful and very remarkable adjustment to regular class. One child with cerebral palsy was returned to regular class and the other made progress towards motor independence. A substantial number of children were returned to regular class when their problems were in specific areas, e.g. one girl received her language arts program in a grade five class but returned to the special class for instruction in other academic subjects. Three children attended regular class for arithmetic instruction.

IV. Additional Help Required By The Special Class Teacher

Ideally both teacher aides and resource teachers should be provided, however, resource teachers can be almost as effective. The original reason for utilizing the three administrative plans was to determine the degree and nature of additional help a teacher would require to implement prescriptive teaching to achieve maximum results. As the study progressed, it became clear that it was not the administrative plan per se which was the important variable. Rather, the amount and quality of interaction with adults appears to be the important variable. Unmeasured variables such as change in attitude toward the school situation; the increase in the number of times the child approached an adult seeking at first social approval and later, assistance with assignments; the change of attitude in the children when adults approached them to teach, praise or admonish; the increase in length of time they could tolerate instruction or participate in group assignments; the lessening of aggressive behavior and the increase in positive social interaction towards other children in the class; the willingness of older children to assist the younger children, all these appear to be related to the question of amount and quality of interaction with adults. Indeed, if this study were to be repeated, an analysis of the interaction processes occurring should be carried out concomitantly.

V. Tests Where Scores Increased As A Result of Direct Teaching

ITPA and Wepman Language test scores increased substantially. The Frostig DTVP test scores increased, understanding of the concept of left and right increased and progress towards dominance as measured by the Harris Test of Lateral Dominance was made. Scores on measures of social development changed only slightly, if at all. In academic areas improvement was made in readiness abilities (except word meaning) as measured by the Metropolitan Readiness Test and increases were made in understanding the natural number system as measured on the Diagnostic Arithmetic test.

VI. Tests Where Scores Increased Without Direct Teaching to the Test

The Stanford Binet mean IQ increased for both the Contrast Group and the Experimental Group. The WISC verbal and performance IQ scores increased for the Experimental Groups as did the WISC pattern scores, however, mean scores in WISC subtests changed only slightly except for the Similarities subtest. Stage of development on the Piagetian logio-mathematical tests increased but except for one group, gains were slight.

The Draw-A-Man mean IQ scores increased for two experimental treatment groups and for the three C.A. groups. The Bender Gestalt test mean scores decreased. Percentile scores on the California Test of Personality were changed slightly but generally in a positive direction. Activity level scores moved towards a "normal" level and scores on the Vineland Social Maturity Scale increased. Scores on the Metropolitan Readiness test increased as did the scores on the Stanford Achievement test.

VII. Can academic Achievement be increased for exceptional children?

Academic achievement did improve for the children in the study although not at the rate expected of intellectually average children. More emphasis should be placed on academic achievement in "opportunity" classes and more consideration given to their areas of strength in order to obtain maximum progress.

VIII. Is it possible to remediate a deficit to the extent that it can be used as a strength?

The answer appears to be yes, however, this is an area which requires considerable investigation. When children for whom the pattern of deficits and strengths appeared to be similar worked together in small groups, the usual result was that the deficit could be ameliorated to the extent that it could be used as a new skill. While this was generally true for the majority in the group, it was not uncommon for one or two children to be incapable of doing so. Possible reasons may be that the test is only detecting superficial manifestations of the problem for some children and/or the etiology of the problem differs for various children and in some it is amenable to change, while in others it is not or requires a different remedial approach. Better diagnostic instruments and more knowledge of programming are necessary before the question can be answered completely.

IX. Is it possible to combine developmental information and learning theory?

It would appear this is a feasible approach, however, better methods of obtaining developmental information must be found, as standardized test results are usually too global to be of practical value. Sequencing of curriculum material as well as knowledge of the child's developmental sequence, both horizontally and vertically, are necessary to find the "match".

X. What is the part to be played by prescriptive teaching in a school program?

If prescriptive teaching is concerned with the total development of the child, it may play a substantial role. If prescriptive teaching is interpreted in a narrow

manner, that is, planning programs on one or two tests of questionable validity and reliability, it is perhaps advisable not to use the method at all. Prescriptive teaching defined in such a narrow way may do nothing more than to teach a child how to pass a test without the ability to transfer skills to areas of academic or social development.

It appears obvious that prescriptive teaching in the wider sense can be used in many situations besides direct teaching. For example, the play period can become a learning period for the child whose teacher is perceptive to the significance of a behavior, quick to take advantage, and subtly makes use of a spontaneous play situation. There are instances, however, when prescriptive teaching is at best a non-profitable approach. The psychotic child is one example where the prescriptive teaching approach is of questionable value. Finally, the degree to which a child may require assistance will determine the amount of time spent in such a program.

XI. Questions and Answers for Future Research in Prescriptive Teaching:

The first and most obvious question concerns the effectiveness of a prescriptive teaching program over a period of at least five years. Closely allied with this question is the need for a tighter research design which will allow both control over relevant variables as well as the freedom to carry out the research in a realistic setting—the classroom.

The variables investigated should be considered by an interdisciplinary team. More valid and reliable assessment techniques are required. We ought to know more about the sequencing of curricula, teaching methods and programs and materials. We need to know more about the development of so-called average and exceptional children. We must discover better methods for training teachers who will be effective, efficient and creative. There is no doubt that the teacher variable is a critical variable.

Many commercial programs must be modified to fit a particular child or situation. Much more is required in the way of creative spontaneity by the teacher in devising programs and curricula in terms of the child's needs and the prevailing situation. It seems obvious that without perceptive and imaginative teachers, any program will fail.

It is necessary to determine the effect of the various interactions which take place between child and adult and child and child, and this kind of information must become part of the teacher's repertoire. Professionals must pool their resources and look at results in the light of various interpretations by disciplines, and questions must be asked (and answered) both in the clinic and the classroom.

The questions under investigation in this study were: (1) to demonstrate the effectiveness of diagnostic or prescriptive teaching, and (2) to investigate the administrative plan which is most effective and efficient for implementing the program. The answer to the first question is tentative. There is encouraging evidence that prescriptive teaching will benefit several categories of exceptional children, at least over the short term. From the experience gained in the study there are many questions which can be investigated. With the latter information it is hoped that a long term study modified by these results will go a long way towards answering the first question.

With reference to the second question, the administrative plan most efficient and effective in implementing the program, it would appear teacher aide and resource teacher combined is the most effective, and resource teacher alone is almost as effective. However, observation leads to an additional tentative conclusion. It is not the administrative plan per se which is important, but the quality and quantity of interaction which occurs. This is an area which must be investigated before the efficacy of prescriptive teaching can be fully determined. A statement made in the introduction of the report bears repeating: Prescriptive teaching is an approach to education which deserves to be tried.

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